

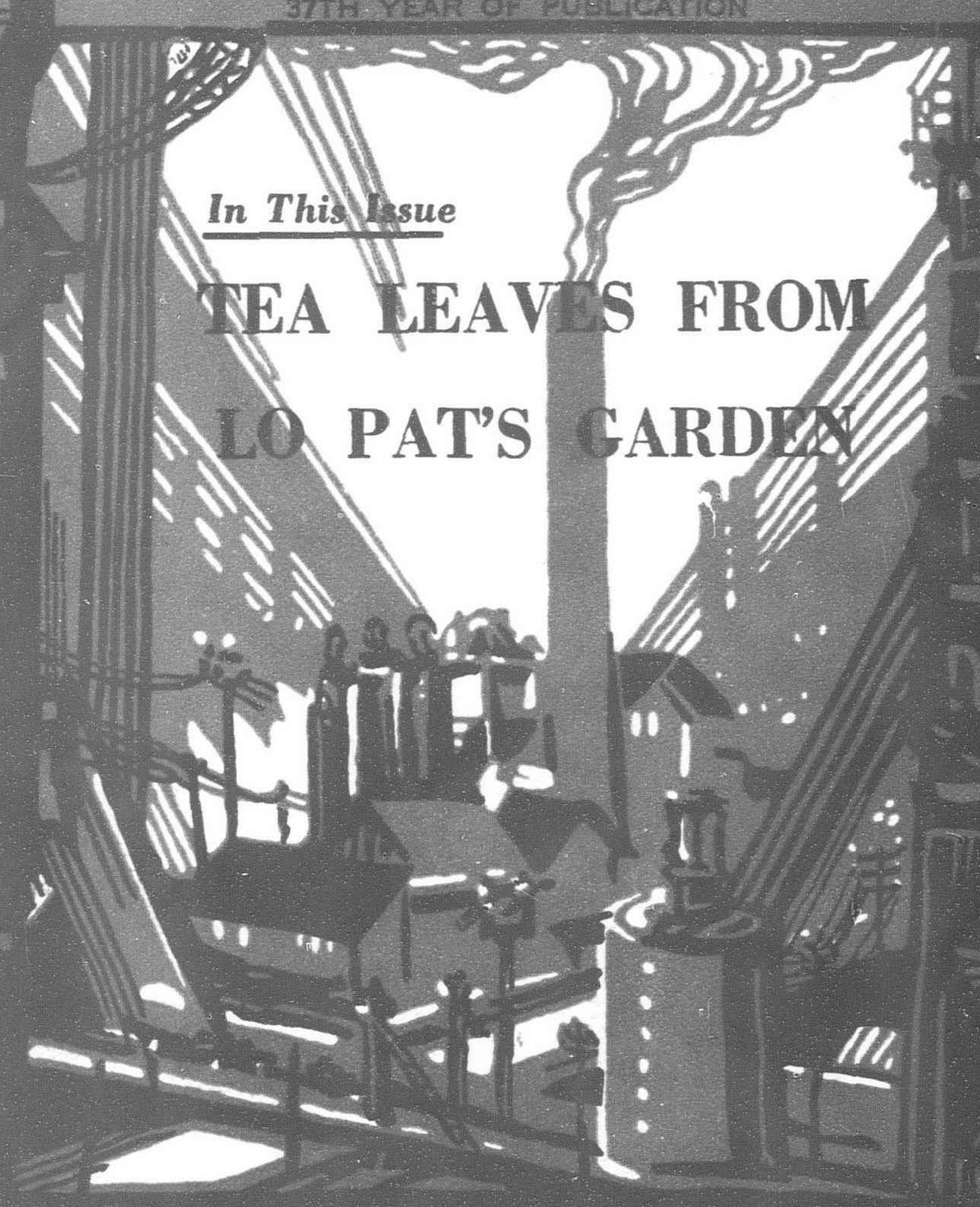
THE FAR EASTERN

REVIEW

FOUNDED BY GEORGE BRONSON REA
37TH YEAR OF PUBLICATION

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LO PAT'S GARDEN



GIVE THAILAND A SQUARE DEAL

SINGAPORE'S OTHER PROBLEM

THE POWDER KEG AND THE SPARK

上海黃浦灘念四號

遠東時報

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No. 4



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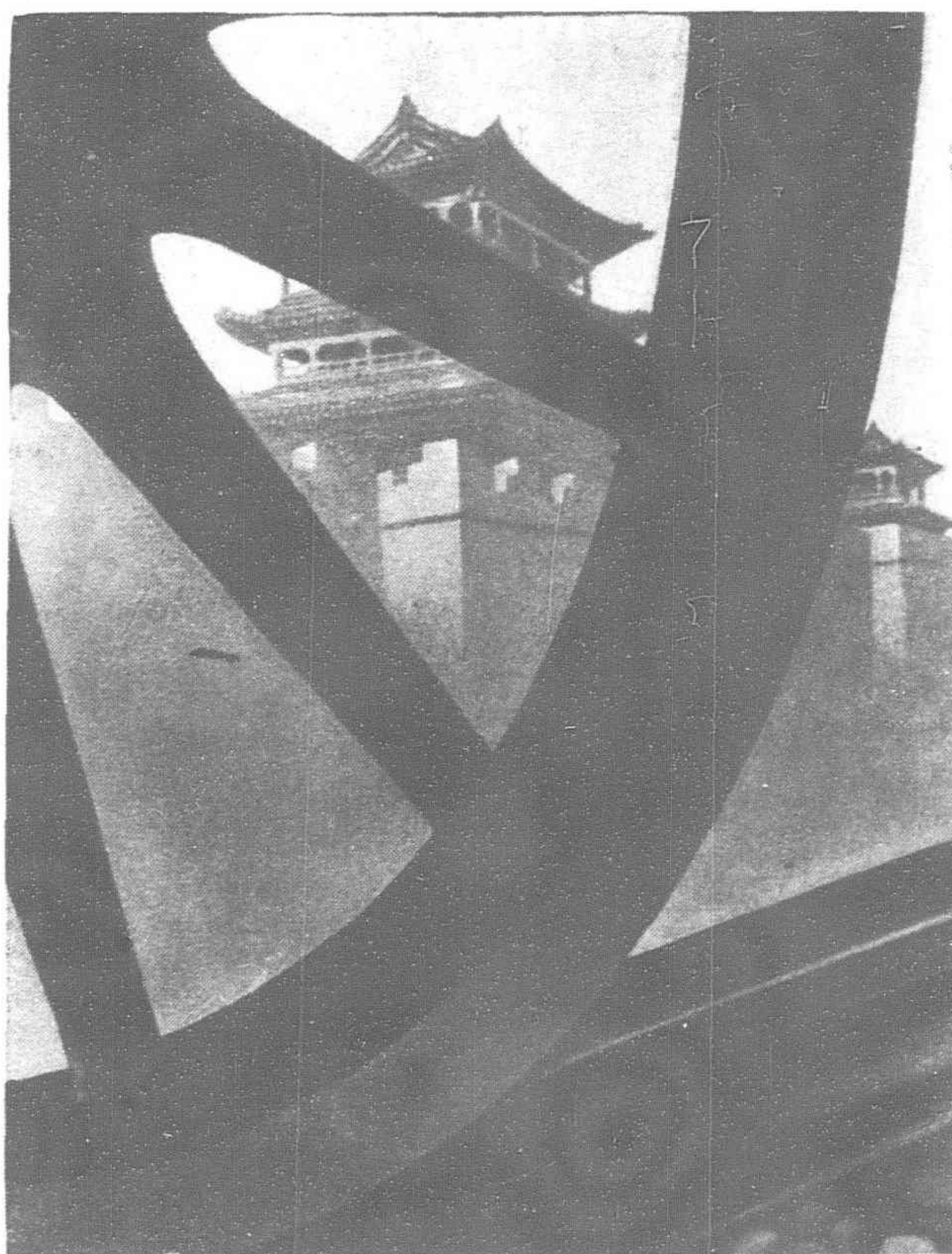
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VOL. XXXVII

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FAR EASTERN CROSS-CURRENTS

Stipulating mutual respect for the preservation and non-violation of each other's territory, a Soviet-Japanese Treaty of Neutrality, effective for five years from the date of ratification, was signed at Moscow on April 13, by the Japanese Foreign Minister, Mr. Yosuke Matsuoka, and the Chairman of the Council of People's Commissars and concurrently Foreign Commissar, M. Viacheslav M. Molotov, in ceremonies held at the Kremlin.

According to a resume of the treaty issued by the Tokyo Cabinet Information Board, the accord contains four articles. A joint declaration was also initialled.

Article 1.—The signatories pledge to maintain peaceful and friendly relations, and mutual respect for the preservation and non-violation of each other's territory.

Article 2.—In the event one of the signatories becomes the object of military operations by one or more third party Powers, the other signatory pledges to maintain neutrality during the entire period of such a conflict.

Article 3.—The Treaty comes into force on the day of its ratification, and remains in force for five years. Unless one of the signatories notifies the other of the annulment of the Treaty one year before the expiration of the Treaty, the pact is automatically extended for a further five years.

Article 4.—The Treaty will be ratified as soon as possible and exchange of ratification instruments will be carried out in Tokyo at the earliest possible date.

In a joint declaration issued after the signature of the accord, the two governments pledged, in accordance with the spirit of the Treaty of Neutrality, their mutual respect of the territorial integrity and inviolability of the Outer Mongolian Republic and the Empire of Manchoukuo.

Japan pledged to respect the integrity and inviolability of the Outer Mongolian Republic while Soviet Russia made an identical pledge with reference to the Empire of Manchoukuo.

Mr. Matsuoka left Moscow on his homeward trip across Siberia a few hours after signing the treaty.

To the Soviet Foreign Commissar, Mr. Viacheslav M. Molotov, with whom he conversed a few minutes before leaving, Mr. Matsuoka declared, "By all means come to Japan soon."

As the Japanese Foreign Minister boarded his special train, both Mr. Josef Stalin, Secretary-General of the Communist Party, and the Foreign Commissar, M. Molotov entered the Japanese official's compartment to say farewell.

High officials of the Soviet Government, Lieut-General Yoshitsugu Tatekawa, Japanese Ambassador; the staff of the Japanese Embassy, the German Ambassador, Count Werner von der Schulenburg, the Italian Ambassador, Sig. Augusto Rosso, the Hungarian Minister, Joseph Kristoffy, the Slovakian Minister, M. Franz Tiso, the Bulgarian Minister and the Rumanian Minister, Dr. Grigore Căfencu, were at the station to bid Mr. Matsuoka good-bye.

Smiling over his achievement, Mr. Matsuoka, in an interview with neutral correspondents shortly before his departure for Japan, voiced his conviction that the Neutrality Pact will serve as a cornerstone for sustained improved relations between the Soviet Union and Japan.

Mr. Matsuoka said that he was convinced that his European trip was not in vain and predicted that the two countries would be able to reach a settlement on pending questions in the spirit of mutual understanding which led up to the conclusion of the neutrality accord.

World Reaction to Pact

Washington diplomats agreed that the Soviet-Japanese non-aggression pact was a diplomatic reverse to Chancellor Adolf Hitler and his Balkan drive towards the Dardanelles and may mark the end of the anti-Comintern front. Rome and Berlin, however, hailed the pact.

Many diplomats in Washington felt the pact constituted a threat to the United States and Britain because it apparently gave Japan a free hand to project its energies southward to Singapore and the Netherlands East Indies.

First British reaction was that the treaty was not unfavorable to Britain because it suggested a growing Soviet desire to cope with German expansion.

German circles in Berlin believed the pact was an additional favorable diplomatic development for the tripartite Powers. Official comment was not available, but D.N.B., official German news agency, reported the pact fully and speedily, indicating German approval.

Italian quarters in Rome hailed the pact as a victory for members of the

tripartite alliance. The pact generally was interpreted as killing any Anglo-American hopes that Russia might intervene on their side in the event of American entry into the War.

Britishers seemed to believe that Russia had the best of the bargain. They believed that Japan now has a free hand to expand south with its rear protected, while Russia has greater freedom to oppose the German threat to the Black Sea and the Dardanelles and Turkey.

The Soviet-Japanese pact, said London diplomatic observers, violated the Axis tripartite alliance since Japan ceased to be bound to aid Germany against Russia.

It would not be surprising if there were reciprocal troop withdrawals from the Siberian frontiers, said military observers in London.

Washington observers displayed the greatest interest, not in the text itself, but in omission of anything stating the treaty's relation to Germany or the tripartite pact or mention of Russia's attitude towards China.

United States interest in the pact included its effect on the European conflict and its Far Eastern potentialities. The pact apparently gave Russia increased freedom with which to oppose Germany's march towards the Dardanelles and vital oil fields beyond, because it enabled Russia to disregard Far Eastern threats if the Soviets should become involved in Europe.

Few observers, however, anticipated any extreme development in Russo-German relations, but most said new developments would make Germany increasingly cautious towards Russia.

Diplomatic circles in Washington pointed out that the pact obliges Japan to remain neutral if Russia becomes involved in military action with any other state or states.

Obviously, Russia's only potential foes are Germany and Japan, hence the pact, in effect, guarantees Japanese neutrality in the event of a Russo-German clash, said Washington observers.

The British Viewpoint

The Russo-Japanese pact marks a perceptible loosening of the bonds of tripartite solidarity, says the *London Daily Telegraph*. At first sight, it might appear a gesture of friendliness towards the Axis, but it coincides with marked

evidence of Moscow's disapproval of the latest Nazi aggressions in the Balkans.

The Russian rebuke to the Bulgarians for aiding the German occupation, the pact of friendliness and non-aggression with Yugoslavia and now the sharp remonstrance to Hungary, all suggest a distinct coldness in the relations of Moscow with Berlin.

There is still more cogent ground for believing that the new pact portends no new rapprochement between Russia and the Axis as a whole. Japan's desire to be sure of Russian neutrality, in the event of war in the Pacific, can be easily understood. With what country does Russia, on her part, anticipate war in which she would like to be sure of Japan's neutrality? The only conceivable answer is—Germany.

The new pact looks very much like notice by Japan that, *vis-à-vis* Russia, the tripartite pact is inoperative.

To secure that is an astute stroke of diplomacy on the part of Russia, the more so since it was gained apparently without the surrender of her right to continue sending arms and munitions to China.

On this view, which alone fits the facts as they are at present known, Russia got a much better bargain. For, if she can rely on Japan's neutrality, she will be enabled to take a much stronger line against Germany in the Balkans.

It would be imprudent to assume that she intends, at any rate for the present, to risk a breach with Germany, but she undoubtedly has freed her hands.

What Japan has gained was already assured her by Germany's obligations under the tripartite pact.

The principal loser is Germany herself, who sees the diplomatic position of her potential rival strengthened. She can hardly have expected this outcome of the inspiration imparted to Mr. Matsuoka, Japanese Foreign Minister, while the guest of his Axis friends.

In the opinion of the *News Chronicle*, the Russo-Japanese pact may prove to be far reaching in its consequences, as was the Russo-German pact.

The provision, whereby, if the latter was attacked by a third Power, the other will remain neutral, is clearly of no great importance to Japan, whereas in the event of a German attack on Russia all anxieties regarding the security of the Soviet in the Far East are removed.

With Russian recognition of Manchoukuo, Japan will feel much more free to pursue her own ambitions in the south Pacific.

While assuming that Russia is still pursuing her policy of complete self-interest, the *News Chronicle* remarks on her change of attitude towards Germany, for which, it says, Russia has good reason and gives as its opinion that a clash between the Red Army and German divisions near the Russian border cannot be ruled out.

The diplomatic commentator of *The Times* says the text of the Russia-Japanese agreement is noteworthy, above all, for its cautious wording.

German and Japanese hopes for a free hand for Japan have certainly not been fulfilled, nor does the Soviet promise to give up their help to China.

On the first reading, the U.S.S.R. seems to have got the better of the bargain.

She is seen to be pursuing her own unemotional policy and, far from joining the plans for aggression, pledges neutrality to Japan only if Japan herself is attacked. What the Soviets would be if Japan were the attacking Power is left unsaid.

On the other hand Japan, a military ally of Germany, has put on paper a promise not to move against Russia if Russia is attacked, presumably even by Germany.

Thus altogether too much should not be read into the pact, and the diplomatic gains seem to go to Moscow.

Solves Problems

Premier Prince Fumimaro Konoye expressed confidence that the newly-concluded Japanese-Soviet neutrality pact will form the basis for a "speedy and concrete solution of various problems."

Describing the treaty as a natural corollary to the tripartite Pact, Prince Konoye declared that the document signed in Moscow "not only is of epoch-making significance in Soviet-Japanese relations, but will also serve to hasten world peace."

Prince Konoye revealed that the Japanese government sometime ago had undertaken negotiations with the Soviets with a view to readjusting relations between the two countries.

The conversations made rapid progress during Mr. Matsuoka's visit, culminating in the signing of the treaty and the simultaneous issue of joint Soviet-Japanese declarations by which Japan guaranteed the territorial integrity and inviolability of the Outer Mongolian Republic, while Soviet Russia extended similar guarantees to Manchoukuo.

This declaration will serve to bring about peace on the Soviet-Manchoukuo and Manchoukuo-Outer Mongolian frontier, Prince Konoye declared.

Duranty Gives View

The whole basis of Soviet Russia's policy in relation to Japan as well as to the Balkans is to stay out of war, Mr. Walter Duranty, *New York Times* correspondent in Moscow, declared in Tokyo on his first visit to Japan.

"The Soviet will not enter the war unless attacked," Mr. Duranty asserted.

Commenting on M. Joseph Stalin's reception of the Japanese Foreign Minister, Mr. Matsuoka, in Moscow, he said that in view of the Soviet policy as a whole, the chances for an improvement of relations between Japan and Soviet Russia are not bad.

As for Japan itself, Mr. Duranty said that this country is not so bellicose as some people abroad are inclined to think.

Mr. Duranty first went to Moscow in 1921 and served as a regular correspondent of the *New York Times* from that year until 1934. He returned to Soviet Russia in 1940.

Early Ratification

Ratification of the Japan-Soviet Neutrality Pact will take place "as soon as possible" in Tokyo, Mr. Koh Ishii, Deputy Spokesman of the Japanese Information Board, revealed at a press conference for foreign correspondents.

If possible "even before the arrival" of the Foreign Minister, Mr. Yosuke Matsuoka, the Spokesman stated, adding that the Government was "endeavoring" to complete procedure for the ratification "as soon as possible." He termed a press report saying that the Privy Council would ratify the Treaty to-morrow as, "too soon." He said that the Privy Council would take time for a careful examination of the Treaty.

The Spokesman pointed out that "in a practical sense the Treaty was similar to a non-aggression pact."

He expressed the hope that the union would show a "favorable attitude" in relation to the China affair, when queried whether the Pact said anything about China, or Soviet aid toward Chungking, adding that he believed that it was possible that the question of Soviet aid to Chungking would be discussed in the future under the Treaty.

Mr. Ishii was evasive when pressed by correspondents whether the Treaty meant that the U.S.S.R. would formally recognize Manchoukuo as an independent state. He said that the Treaty "implied" Soviet recognition.

He disclosed that Russian and Japanese were used as official languages in the Treaty, adding that the full text would be made public soon after ratification.

Signature of the Soviet-Japanese trade treaty will take place within a "few days," Mr. Ishii stated.

The Spokesman said that questions of concessions and fisheries were being discussed separately, stressing that the Portsmouth Treaty would not be affected in any way.

He said that he "could not say whether or not economic conversations between Japan and the Netherlands East Indies in Batavia were progressing favorably." He asserted, however, that the Government was "endeavoring to reach an amicable conclusion." On the other hand, talks between Japan and French Indo-China were progressing more favorably, the Spokesman revealed, declaring that he expected a conclusion in the near future.

Mr. Ishii also disclosed that trade negotiations were going on with Thailand.

Japanese Press Opinion

After the first flare of enthusiasm for the new Soviet-Japan neutrality pact voiced by the Japanese press the metropolitan newspapers adopted a calmer and more reserved tone. A number of editorials urge caution to be used in Japanese-Soviet relations, and the view is expressed that unless Moscow suspends aid to China and reaches a conclusion with Japan on various issues at present

outstanding between the two countries, the pact will be valueless. The pact should not be construed as a gesture of goodwill to Japan, one newspaper says, but is the natural policy of the Soviet, which seeks to profit by the wars of others.

It cannot be said that Japanese-Soviet relations are yet fully adjusted as a result of the new neutrality treaty, says the rightist newspaper, *Hochi*.

"This pact is merely a fundamental preliminary to entering into friendly relations," the *Hochi* says, adding that there were still the problems of "fisheries, oil, frontiers and trade to be concertedly solved."

The pact favors Japan, however, rather than the Soviet, the *Hochi* declares, and from this standpoint it was a "signal success for Mr. Matsuoka."

The *Hochi* comments conclude by saying that the pact was "but the first step" in gaining Japan's objectives, but it is to be welcomed that Japan's southward policy can be furthered.

The commercial daily, *Chugai Shogyo*, strikes a critical note when it comments that the policy of the Soviet was "to regain lost territory without bloodshed," and to further this aim Soviet Russia remains neutral and avoids involvement in actual warfare. The Soviets thus prolong the war over the whole world, the newspaper adds, and wait for the exhaustion of all other nations so that when peace comes it finds her the strongest nation and able to dictate the peace. Declaring the neutrality pact to be the natural policy of the Soviet and not necessarily a gesture of goodwill towards Japan, the *Chugai Shogyo* concludes its editorial by saying that the pact would be valueless if in future the Soviet continues aid to China and if the various problems outstanding between Russia and Japan remain unsolved.

An editorial in the *Kokumin* urges Japan to take full advantage of the pact and to live up to its stipulations, although, the newspaper warns, "the Soviets have in the past broken several such treaties and do not seem to hold them in high respect."

"The pact is a blow to Chungking and to Washington," the same newspaper says, adding that Japan would be freer to take stronger action against China and the United States and push the conclusion of the "China Affair" to the limit.

"Secret Clauses"

It would not be surprising if reports suggesting secret clauses in the Japanese-Soviet neutrality pact were true, writes the diplomatic correspondent of the *Times*.

"Certainly, the clauses, as published, are remarkable for their omissions. They have no word about the Three-Power pact. How does Japan's new promise of neutrality with Russia fit in with her military alliance with the Axis? Nor is there any word about China. Will Soviet help to Chungking continue?"

"Suggestion by Japanese newspapers that Moscow has promised to join in

trying to end the war in China, may mean nothing in themselves; they could be put out in any case.

"More truly ominous is Soviet comment. With the echo—which cannot be accidental—of Japanese declarations of 'Japan's historic mission in the Far East,' the *Pravda* yesterday stated that the development of both countries made it imperative for them to be good neighbors, 'and not to hinder each other in the realization of their historic task.'

"All that can be said for certain is that Russia and Japan have thought it profitable to make a public gesture of friendship—Japan, because, with German encouragement, she wishes to be freer for southern adventures or menaces; Russia, because she wishes her back-door to be a little safer in case she has to face heavier demands or subtler tricks from Germany."

Denounces Russia

Chinese newspapers strongly denounce Russia, in connection with the Soviet-Japanese neutrality Pact.

The influential daily, *Ta Kung Pao*, which had hitherto been a staunch supporter of close Sino-Soviet relations, makes a bitter attack on Russia.

"While the word 'peace' appears frequently in the pact, it must be stated that the pact will result in the opposite because it facilitates Japanese military operations against China and Japan's southward move in the Pacific against Great Britain and the United States," the *Ta Kung Pao* asserts.

"Though it is not yet certain whether Japan will move southward, the fact that the pact will facilitate Japanese operations against China, is too obvious, thereby affecting Sino-Soviet friendship."

"Furthermore, the Soviet-Japanese pact is contrary to the spirit and letter of the Sino-Soviet agreement signed in Peking on May 31, 1924 and the Sino-Soviet non-aggression pact signed at Nanking on August 20, 1937."

"Faithful to her treaty obligations, China has persistently refused to adhere to the anti-Comintern pact, despite Japanese persuasion and intimidation, which was the immediate cause of war between China and Japan," the *Ta Kung Pao* adds.

Roosevelt Tells Aims

President Roosevelt, in a nation-wide radio broadcast, declared on March 15 that the United States had started the flow of material aid to Britain and other anti-Axis powers and that this aid "will be increased—and yet increased—until total victory is won."

The occasion for the speech was the annual White House Correspondents' dinner, at which he was the guest of honor.

Specifically, the President promised Britain and Greece ships, planes, food, tanks, guns, ammunition and supplies of all kinds.

"China asks our help," Mr. Roosevelt said. "America has said China shall have our help."

The national will would not be frustrated, he declared, "either by

threats from powerful enemies abroad or small, selfish groups and individuals at home....Let not the dictators in Europe and Asia doubt our unanimity now."

The President prefixed his speech with the pregnant phrase "Everything I have to say is word for word on the record."

Referring to aid to China, the President said, "China is like Britain, Greece and the other democracies fighting to-day."

Warning that sacrifice and inconvenience lay ahead for all, President Roosevelt said that "total victory" over dictators was to be the objective of an American "total effort," unflaggingly sustained, to place implements of warfare in the hands of nations resisting aggression.

People must be prepared for lower profits and longer hours, he said, and the effort must not be obstructed by unnecessary strikes, war profiteering and other such things.

He hailed the passage of the "Lend-and-Lend" Bill as a decision ending all "attempts at appeasement in our land, the end of urging us to 'get along' with the dictators, the end of a compromise with tyranny and forces of oppression."

The address was one of the most vigorous utterances the President has made. It bristled with the determination to eliminate Nazism as a world force, and dedicated the material and industrial resources of the United States anew to that purpose.

The speech was later broadcast in 14 different languages, including those of the German-occupied countries, throughout the world.

To Give Aid

Any country which was resisting invasion from any of the Tripartite Alliance's three Powers would receive assistance from the United States under the "Lend-Lease" Bill, Mr. Cordell Hull, Secretary of State, said.

Mr. Hull said that China came within the category of countries resisting aggression. Although he did not mention Japan by name, observers noted that Japan, a member of the tripartite alliance, was attacking China.

Asked what countries beside Britain might be aided by the lend-lease appropriation Mr. Hull replied:

"Our assistance would be contemplated for any country carrying forward a movement of resistance against the three invading forces which under the Tripartite Agreement are rather closely interrelated countries."

"Our assistance would be to countries whose defense would be essential to ours as was stated here. You will find this determined by developments. This situation is moving so rapidly that nobody knows from one day to another what nations may be swallowed up or what nations may resist. It would be extended to any country that would thus get into that picture."

Matsuoka Attacks U.S.

Mr. Yosuke Matsuoka, Japanese Foreign Minister, at Berlin on March 29, launched a verbal attack against the American press for belittling Japan's strength and fighting determination in the China campaign. At a press conference, Mr. Matsuoka explained that the Americans did not understand Japan nor the Japanese and therefore they underestimated Japanese tenacity.

American press attacks on Japan, he added, could not shake the belief of intelligent people outside the United States. "I can tell the world that Japan can fight for ten years and even longer in China without becoming fatigued," he said.

"Americans err considerably when they entertain such views," he replied, when asked to comment on American press reports that Japan was exhausting her strength in the China campaign.

Japan, Mr. Matsuoka added, would become stronger and greater instead of weaker in the future because she was continuing to develop all its productive energies despite the fact that her fighting forces busily were engaged on Chinese soil.

The Japanese Foreign Minister made it clear that Japan would fight if the United States entered the war, but added that he had not given up hope that the Pacific Ocean would become a sea of peace.

He pointed out that the new order could not be checked either in the Far East or Europe.

"For 30 years I have had a vision of a new order," he said, adding that Japan would fight with full determination to establish such an order.

Defines Japanese Aims

That Japan is opposed to an extension of the present world conflict, as far as she herself is concerned is the view expressed in a leading article published by *Le Temps*, commenting on the visit to Europe of Mr. Yosuke Matsuoka, the Japanese Foreign Minister.

"One may safely surmise that so long as her conflict with China still continues, Japan is desirous of avoiding an extension of the conflict into which she herself may be dragged," *Le Temps*, added.

"An indication of this may be seen in the recent communication dispatched to London by Mr. Matsuoka which was freely and widely interpreted as a Japanese offer of mediation. This offer was at the time formally denied by Berlin, Rome and Tokyo itself. One must also keep in mind the declaration made in Vienna by the Foreign Minister of Germany whereby Germany's main aim is to localize the war, and recalling that so far the Reich has not asked any power to come to her assistance in her war against Great Britain."

Commenting further on Mr. Matsuoka's trip to Europe, the newspaper asserted that Clause 3 of the Tripartite Pact, providing for mutual assistance between the signatories in the event of a

third power intervening either in the West or in the Far East, was the main topic discussed by the Japanese Foreign Minister.

It is very significant, the newspaper concluded, that this clause is directed at both the United States and Turkey, and that Mr. Matsuoka decided to make his trip to Europe following the adoption of the Lend-Lease Bill by the U.S. Congress.

An Economist's View

Economic desperation may impel rather than block a Japanese military drive southward into the rich islands of the Pacific, Dr. Robert C. Shook, an economist, declared.

In an interview with the United Press, Dr. Shook, vice-president of the International Statistical Bureau and co-author of the recently published book "American Business in a Changing World," asserted that it would represent "wishful thinking" to believe that progressive economic deterioration will prove a prelude to lessened Japanese military activity.

Dr. Shook said that there can be no doubt of the steady deterioration of Japan's economic position with currency circulation, prices and the cost of living showing inflationary increases and the empire's foreign trade curtailed by both the European war and moral and actual embargoes growing out of the straining of political relations between Nippon and the United States.

Collapse Not Inevitable

"However," he warned, modern economic history as written since 1933 emphasizes the fact that economic pressures do not necessarily result in depression and collapse and a limiting of the national effort.

"Frequently the result is exactly the opposite. Where centralized authority already is in control the result of internal economic pressures frequently reflects itself in a strengthening of that control and a speeding up of political aggression and external military activity.

"Economists who at first predicted a collapse in Germany because of the unorthodox methods of internal finance and foreign trade that were adopted in the late 'thirties now recognize that later Nazi aggressions partly reflected the need for a safety valve against internal deterioration."

Dr. Shook declared that developments in Japan support the belief that Nippon now is passing through much the same stage as did Germany prior to outbreak of the European war.

Recent legislation permits the government to requisition foods, lands, houses, mines, patent rights and funds," he said. "Wages, salaries, profits, exports and imports and news will be rigidly controlled and labor disputes can be suppressed. The Navy Minister is about to take over full control of Japan's merchant fleet with the power to establish convoy systems and control all movements of and communications with Japanese commercial ships.

"These are not the moves of a government which is feeling economic pressure and which is planning to reduce its military activity as a result. Rather, while these moves recognize the economic pressures, they indicate that the result will be one of strengthening military activity, instead of weakening it, provided the opportunity arises."

The economist warned, however, that there was a danger in carrying "too far" analogies between Germany and Japan.

Germany, it is plain, is stronger in a military sense than was commonly thought. It is not so plain that Japan is equally stronger than the adversaries that might be arrayed against her in the Far East—assuming that Great Britain manages to survive the ordeal which is anticipated in coming months.

"Put in other words," he continued, "Germany in the late 'thirties was powerful enough to make her own opportunities whereas Japan seems limited to taking advantage of such opportunities as may present themselves in the months to come."

"How great or small these opportunities will be, depends more and more on United States policy, both because United States aid may be the means of continued existence for Great Britain and because of the power of the United States to exert economic and political pressure on Japan if this should be dictated by questions of foreign policy."

Will Not Employ Force

Japan has no intention of resorting to force in realizing her plans in the South Seas, the Premier, Prince Fumimaro Konoye, declared in an interview with the press early in April.

"Japan's peaceful intentions have been clearly demonstrated in recent efforts to bring about a peaceful settlement of the Franco-Thai border dispute," Premier Konoye asserted. He added that "what Japan desires in the South Seas regions is economic co-operation and nothing else."

Turning to relations between Japan and the United States, the Premier predicted that the latter as well as Great Britain, may increase assistance to the Chinese Government.

Questioned as to what he thought of future Japanese-American relations, Prince Konoye replied "I admit the present relations between the two countries are not so hopeful, but I am confident there is nothing between Japan and America which cannot be settled peacefully."

"I do not expect any turn for the better, but I am sure that relations will not take a turn for the worse," he continued.

Commenting on Sino-Japanese affairs, Prince Konoye referred to his statement on November 3, 1939, declaring that "there is no change in fundamental policy than that expressed then. If the Chungking regime gives up its policy of armed resistance against Japan, we shall be more than glad to negotiate for general peace in China."

He believed that "certain personal changes in the Chungking regime could bring about general peace in China immediately."

In regard to the domestic political situation, Prince Konoye said that he did not expect any new changes in the Cabinet other than those already made.

Singapore Armament

The outstanding impression of a trip to Singapore in April was the constant arrival and departure of luxury liners converted into transports, proving beyond doubt that the southern Pacific and Indian Ocean are still controlled by the British and Australian navies.

The use of numerous British Army transports also indicated that the British were strengthening enormously the Singapore garrison.

Some of the most famous British regiments are doing duty in Singapore and the streets and hotels are a constantly changing riot of color as Scots, Australians, New Zealanders and Indians intermingle.

Reports were circulating among military quarters that six and eight-inch coastal defense guns were being sent to Sarawak and that a large garrison soon would be ordered to duty at Borneo.

The predominance of American Brewster Buffalo fighters becomes at once obvious to a casual visitor to Singapore. British pilots call the Buffalo fighters the "best yet. We want all we can get."

They said that these planes were their favorite fighters and even compared favorably with the finest Spitfires.

Singapore's airport is a beehive of activity, with Blenheim bombers, training planes and Buffalo fighters taking off and landing almost continuously throughout the day.

British pilots are astonished at the great speed of the fleet, short-winged and squat Buffaloes which outrace British fighters darting across the sky over Singapore.

Many pilots stationed in Singapore have been transferred to the Far East for a rest from their arduous duties in Europe. Many of them are aces.

The Manila Conference

Conferences between American, British and Dutch officials at Manila ended on April 10 with all concerned being non-committal regarding details of the conversations.

Air Marshal Sir Robert Brooke-Popham, Commander-in-Chief of British Far Eastern forces, left for Singapore by aeroplane. Mr. E. N. Van Kleffens, Foreign Minister of the Dutch Government returned to Batavia.

Mr. Francis B. Sayre, United States High Commissioner to the Philippines, returned to Baguio after conferring with the British and Dutch authorities.

Although no official statement was issued, Manila papers featured the three-Power conference between Mr. Francis B. Sayre, United States High Commissioner for the Philippines; Air Chief Marshal Sir Robert Brooke-Popham,

British Commander-in-Chief of the Far East; and Dr. E. N. van Kleffens, Netherlands Foreign Minister, as an indication that defense in the Far East is beginning to take shape.

Undoubtedly, an exchange of information has taken place, and it is a happy coincidence that Sir Robert and Dr. van Kleffens met.

After a 90-minute conference with the British Commander-in-Chief and Dutch Minister at his residence. Mr. Sayre uncommunicatively replied to a direct question whether the subject of the conference was not common defense in the Far East, that the talks centered on the "general situation." It was natural for him to receive and talk with foreign authorities passing through Manila, he added.

Admiral Thomas C. Hart, Commander-in-Chief of the United States Asiatic Fleet, was not present at the talks, being absent on routine manoeuvres.

Meeting Is Significant

The Washington *Sunday Star*, in an editorial, described the recent Manila conversations as another demonstration that the United States, the Netherlands and Britain "inevitably are drawn together in common defense action" as a result of Japan's adherence to the Axis and other Japanese "aggressive moves in the Orient."

The *Star* referred to the recent talks between Admiral Thomas C. Hart, Commander of the U.S. Asiatic Fleet, American Army chiefs and Air Marshal Sir Robert Brooke-Popham, Commander of Britain's Far Eastern Forces, at Manila.

"It is interesting to note," the editorial said, "that the United States is taking the lead in what amounts to a common diplomatic and strategic front in the Far East, defensively directed against further Japanese aggression....."

"Another important development in the same line is the decision of our Government to spend U.S. \$50,000,000 on defense in the Philippines....."

"Incidentally, the attitude of the Filipinos seems to be changing rapidly from fear of Japan to self-confidence."

Chiang Is Speaker

Military and economic warfare should be waged simultaneously and the greater emphasis should be placed on the latter as China's military crisis has passed, General Chiang Kai-shek, in his capacity as leader of the Kuomintang Party, declared in the opening address before the eighth plenary session of the Central Executive Committee of the party on March 24, at Chungking.

Out of the 240 members of the Central Executive and Supervisory Committees, 159 attended the meeting.

In his speech, the Generalissimo warned the members present that the Kuomintang had gradually drifted away from the people, and that the party members had lost their revolutionary spirit and had become lax in their work. He strongly urged them to return to the people and to revive the spirit of the

revolution in order that the Kuomintang may live up successfully to its leadership in the nation's dual task of resistance and reconstruction.

The Generalissimo then declared that China's greatest crisis has passed, but added that this did not mean that there will be no more dangers in the future. Greater hardships will have to be borne and greater sacrifices made in order to obtain a final victory, he said.

General Chiang laid stress on economic warfare, asserting that the key to success or failure in China's resistance lies in economics, which will share 70 per cent and military affairs only 30 per cent in the decisive factors of the war.

"Public opinion is at present unduly apprehensive over economic problems," he said. "According to my observations, China's economic position does not give much cause for alarm. The only question is whether we can undergo hardships and sacrifices, whether we can embark upon the phase of positive reconstruction."

"There are people who criticize the work of the Kuomintang Party as being too loose," the Generalissimo went on. "Some even say that we have become corrupt and out-dated. These criticisms we should admit and accept. From to-day on, we should thoroughly review past mistakes and take steps to rectify them."

In retrospect, General Chiang noted that during the last eight months since the previous meeting of the Kuomintang, the fighting spirit of the latter has steadily deteriorated. From the party to the Government, from the central to the local authorities, there has been a lack of new spirit and lack of new strength. This, he said, is the greatest danger confronting the country.

He asserted that the responsibility for this state of affairs did not rest upon the Government, the masses, or pernicious internal and external circumstances, but should be placed squarely upon the shoulders of the Kuomintang.

A new political atmosphere should be created and a new party spirit be fostered, he said. To consummate the task of national reconstruction, there must first be a political "new deal" and the party must first be placed on a sound basis.

Chides Communists

The attitude of Generalissimo Chiang Kai-shek towards the present Communist situation is defined in an interview between Gen. Chiang Kai-shek and the Communist representatives Mr. Chow En-lai and Mr. Yeh Chien-ying which took place on June 10, 1939, and is published for the first time in the fortnightly magazine *Chinese*.

Following numerous cases of friction between the Communists and Central Government, Generalissimo Chiang Kai-shek, for the purpose of a fundamental solution of the Communist problem, summoned Chow En-lai and Yeh Chien-ying for an interview in which he declared:

"The crux of the present Communist problem does not lie in a few

districts in Northern Shensi Province, it lies in whether the Communist Party will have the sincerity to obey the orders of the Central Government and enforce the national laws, thereby establishing a good example in the Chinese revolutionary movement instead of remaining outside the national system, they creating a special position and establishing a precedent for other reactionary elements trying to establish separate authority."

"I am the leader of the National Revolutionary Movement, and I take a national and just stand in the administration of national affairs, I will not listen to the reports of one individual or of one group, or assume an attitude of partiality. My decisions are entirely inspired by the interests of our nation and race.

"For the cause of our revolutionary movement I will never indulge in compromise or toleration. The Communist Party, in order to solve certain problems, frequently create special situations for the purpose of exerting pressure on me.

"I am the leader of the national revolutionary movement, and must therefore settle fairly all problems in accordance with the revolutionary spirit, and cannot permit any such attitude.

"In order to seek a proper solution of the present friction in various places, the Communist party must sincerely obey the orders of the Central Government and enforce the national laws, thus restoring normal conditions. If they do that I will never be unfair towards the Communist Party.

"In matters affecting any issue or individual I always adopt an attitude of kindness and love, and I will adopt the same attitude towards the Communist Party. Whether I give instructions to the Communist Party or even reprimand them, I do it in the interests of the Communist Party, and always hope that the Communist Party will set a good example in the Chinese Revolutionary Movement.

"All our plans and activities must be in accordance with our sole aim of national unity and independence. Unless we have national unity we cannot have independence, and therefore our efforts toward national unity are in the interests of the welfare of the nation and race, which must also be the aim of the Chinese Communist Party."

Wang Ching-wei Tells Aims

Establishment of permanent peace based upon co-operation between the Chinese and Japanese, and not merely cessation of hostilities, was the aim of the Nanking Government which celebrate the first anniversary of its return to Nanking on March 30, President Wang Ching-wei declared in an interview.

Outlining the plan to be followed by the Nanking Government to attain this goal, President Wang gave illuminating details. He stressed the following five points.

(1) Steps to be taken against corruption in administration.

(2) Stability of currency and adjustment of commodity prices.

(3) Rehabilitation of agriculture, farmers, and development of industries.

(4) Training of youth and encouragement of science.

(5) Elimination of Communism and strict maintenance of peace and order.

Questioned on the effect of both the European and Asiatic situations on the Chungking régime, Mr. Wang asserted that Chungking, a "willing tool" in the hands of third Powers, was going rapidly down the "road to ruin."

The fact that Chungking places faith in the continuation of the European war and the turbulent situation in the Pacific to prolong its resistance, will not in any way check the decline of the Chiang régime, he added.

Turning to the Communist problem, Mr. Wang asserted it was inevitable for Chungking and the Chinese Communist Party to be at cross purposes. There is no room in China for Communism, he emphasized.

Amplifying his statement, Mr. Wang declared Communist opposition played a great part in hindering the materialization of peace efforts.

Chungking's alleged subserviency to third Powers' demands and wishes, he stated, actually was pointless. These third Powers were each seeking their own ends to the detriment of China, Mr. Wang pointed out.

Arms For China

A fourfold increase in United States arms exports to China in February compared with the preceding month was revealed in the monthly State Department report, which also showed that China was granted new arms licences in February to a record amount for military planes almost exclusively.

Actual shipments of war materials to China in February aggregated U.S. \$2,673,000 of which U.S. \$2,271,000 was for warplanes and the remainder for explosives, while new licences amounted to U.S. \$6,310,000 of which U.S. \$6,308,000 was for aeroplanes and the remainder for aeroplane gun mounts and other armament.

Considered valuable military information for the first time, the report gave no separate export figures for the different parts of the British Empire, but gave only global figures including the Dominions, Colonies, mandates, as well as "British armed forces elsewhere." The total amounted to U.S. \$31,415,000 in February, of which U.S. \$11,959,000 was for aeroplanes and U.S. \$9,033,000 for aeroplane engines. Figures for the Dutch Indies were U.S. \$879,000 of which U.S. \$347,000 was for warplanes, U.S. \$238,000 for machine-guns and automatic rifles; Greece, U.S. \$105,000, Mexico, U.S. \$343,000 and Thailand U.S. \$22,000.

New licences granted to the British Empire totalled U.S. \$11,804,000; for the Dutch Indies, U.S. \$7,566,000 and for Mexico, U.S. \$199,000.

The current figures do not reflect shipments to Britain since the passage of the Lease-Lend Bill.

Thailand Grateful at Bangkok

Official comments at Bangkok unanimously hail the peace terms reached at Tokyo as a success for Thailand, and emphasize Thailand's gratitude to Japan, though a section of the press hints that Thailand expected something better.

The Premier, Luang Pibula Songgram, appealing to the public to celebrate the "successful conclusion" of the Tokyo conference, says Japan untiringly executed her task with efficiency, thoroughness, and strict maintenance of justice for the sake of peace in this part of the world.

"When someone does us a good turn," he adds, "we forever appreciate and cherish it in our memory."

A Foreign Ministry communique declares that Japanese mediation has brought Thailand a square deal.

The Bangkok *Chronicle*, a Thai-owned daily in English, says though it may be felt that the territorial gains were slightly below expectations, this is an occasion for national rejoicing.

The vernacular *Prajamit* declares that France has ceded only a small portion of the territory lost to her by Thailand, "but we are thankful to Japan for her mediation."

The *Supab Burus* declares that Thailand's prestige has been restored in the eyes of European nations, while the *Thai Mai* asserts that the treaty is satisfactory, and that Japan is the most powerful nation in the east and can protect all other eastern nations against aggression. "She is always our best friend," it adds.

The Premier visited the Japanese Minister, Mr. Futima, yesterday afternoon and thanked Japan. This is the first time that the Premier has called on the Japanese Minister since assuming office over two years ago.

Reaction In Japan

Although condemning the speech by President Roosevelt on March 15, Tokyo's vernacular press manifested no surprise and adopted a calm, though bitter attitude to the President's words.

The *Asahi* hinted that Japan would be forced to adopt the attitude of Chancellor Adolf Hitler toward aid to Britain, with regard to American aid to China.

The papers unanimously declared that President Roosevelt was leading the United States into war.

The United States, said the *Asahi*, is taking advantage of the fact that Japan and China, technically are not at war to transport arms and munitions to China in American ships.

"In that event," said the *Asahi*, "there is no alternative but to frustrate it with the same resolve as that recently professed by Chancellor Adolf Hitler."

The *Nichi Nichi* said that President Roosevelt was aiding Britain, France and the Netherlands "like insatiable vultures" to continue exploiting Asiatic races. The President also was aiding Generalissimo Chiang Kai-shek in fighting Japan and thus attempting to exhaust Japan by prolonging the Sino-Japanese conflict, the paper said.



In incomplete marriage
The stupid are more likely to
be happy
Than the intelligent who know
That they have been cheated.

The husband who complains of
the expense
Of his family
Is but a bachelor in disguise.

The man who thinks his family a burden
Is in love with self.

A model may be a menace to a man's life
But she can be a great inspiration to art.

Many who criticize a woman
For sticking to a worthless mate
Would never expect a good egg
To return to its shell
Because the ham in the
frying pan
Had a bad smell.

Radicalism is not immune from the laws
Of the universe.

The atrocities of radicalism equal
The intensity of the abuses causing revolt.

Where the square deal predominates
The big stick gathers moss.

The sins of the head-strong in power
Are visited on the meek
Even unto the third and fourth dimensions.

The meek may inherit the earth
After the aggressive have taken possession
Of heaven.

Honor
Must have strayed
If it fears
Dining or walking with
The opposite sex.

A chaperon is a challenge
To the chastity of youth.

Demosthenes set the pace
For after-dinner speakers
When he filled his mouth
With stones.

'Tis certain that the Sphinx
Would not be half so interesting
If it were to make an after-
dinner speech.

Youth is enamoured
By hopes of to-morrow.

Middle age knows
That life consists of
A chain of to-days
With happiness
Dependent
Upon how we
Forge each link
In the chain.

Contempt of meanness
Is the only
Hatred that is elevating.

Judge not—
For thy neighbor's provocation
Might be greater than thine own.

Be not hasty with apologies
Lest thy friend
Be the first to offer excuses.

There is tragic beauty in art.

To write always
Of spring and sunshine
Would be as colorless
As a world peopled only
by angels.

Give Thailand A Fair Deal

By MARC T. GREENE

AMERICA and Britain, always heretofore her best friends, are now treating Thailand as if she were a potential if not an actual enemy. British censorship, as I found from personal experience the other day, very meticulously examines everything and everybody coming out of Thailand. America refuses to let the Thais have the planes that were legitimately purchased and shipped as far as Manila.

What is the basis for all this? Obviously that Thailand made an endeavor, very likely at an inopportune moment, to recover some of the territories lost to France during a period of three-quarters of a century and accepted the Japanese offer to mediate the dispute. The mediation resulted in Thailand's recovery of about 75,000 square kilometers of the 455,000 lost, together with vital riparian rights on the upper Mekong River.

Thailand, then, appears to be paying for this recovered territory with the long-possessed friendship of the Western democracies and it is not a good bargain. Thailand would clearly have done better to have "respected the *status quo*," as the saying is, which was the thing she was advised to do by both Washington and London. That is a point I will elaborate presently, but first it is in order to give a brief outline of Thai history through the past 75 years.

It is in order to do that because there can be no fair adjudication of the long-standing Thai-France controversy and no fair deal to Thailand without understanding something of a succession of acts of the most ruthless imperialistic aggression.

The Toll of 75 Years

Prior to 1863 Siam was a country almost twice as large as it is to-day. A good deal of that difference was riceland, very essential to the soundness of the national economy. Some was teak forest, almost equally essential. Important, too, were the riparian rights, i.e., fishing and transportation rights, on the Mekong River.

Chinese propaganda has disseminated all manner of misinformation about Siam, then and now. A publication called the "Fortnightly," in Hongkong, not long ago stated that Siam was, prior to 1892, a Chinese dependency, a preposterous fabrication. The same publication has tried to establish that since Thailand's change to a constitutional monarchy the three-quarter million Chinese in the country have been subjected to all manner of ill-treatment and oppression. That, too, I shall go into directly.

Meanwhile, let us go back a bit. In 1863 the French decided to "take over" Cambodia. It then belonged to Siam and was inhabited, at least in the measure of 75 per cent, by people of the Thai race. It had a king and he was on the friendliest terms with the King of Siam. In the archives of the Thai Foreign Office is a letter written by him to the Siamese king in which he sets forth his continued loyalty and affection but bitterly deplores his helplessness in the face of the French demands that he sign the treaty of "protection." It is rather an extraordinary document, showing as it does the operations of imperialistic aggression at their worst.

Anyway, the Cambodian sovereign had no choice. He was forced to deed over to the French, under the thin guise of a "Protectorate," his country. Similar operations and transactions took place at intervals down to 1904. The worst was in 1893, when the French demanded a total of some 165,000 square kilometers of Siam. This time the Siamese appealed to both Britain and America the while French gunboats blockaded the entire Siamese coast and cut off Bangkok from the outside world.

No aid was forthcoming, of course. It was merely one Western Power at the old, old game, the game so bitterly resented when any Eastern Power starts playing it. The French were great "colonizers," this being the usual term used to justify the greatest of all international rackets.

But there was nothing little Siam could do about it and nothing was done. America, at least, placated the Siamese a little some years later when she took the initiative toward the abolishment of extraterritoriality. But the burden that lay most heavily upon Siamese economy in the matter of the land-grabs was the loss of

the river rights. France's sole excuse was never anything but that Siam was not "efficiently administering" the territories in question leaving them a menace to the development of Indo-China.

The Riparian Rights

In this section the river constitutes the boundary between Siam and the Indo-Chinese province, or "protectorate," of Laos. And so, according to long-established principles of international law and usage, transportation as well as fisheries rights on the river should be the privileges of the nationals on either side.

The French, however, forced the Siamese into a convention that, having provided for a French grab of the islands in the river, permitted the Siamese the use of the channel only where that channel led between the islands and the Siamese shore. But that was only the case for a certain distance. At the end of that the Siamese were forced to turn over their transport, mostly of the valuable teak which is Siam's second industry, to French operators on their own terms, generally all the traffic could possibly bear.

This was the position in the matter of the river rights until the recent mediation returned them to the Thais. It resulted in years of heavy losses to Thai economy in which the teak-growing industry is so important. And it was a ruthless violation, through the might of a large country, of accepted international principle and of decent international usage.

Protests to America and Britain did no good, of course. But the feudal governments headed by Prahjadipok and his ancestors were too easy-going and indifferent to carry such matters very far. Only after the radical change resulting from the bloodless revolution of 1932 was the dispute taken up again. In 1936 Thailand asked France to consider the question of boundary rectification. This disposes of the commonly-accepted charge against the Thais, that the new constitutional government made no attempt to secure the boundary readjustment until France had fallen under the German heel.

However, no real attention was paid the request. France was engaged in "colonizing" along characteristic lines, and nobody who knows anything about the condition of the native peoples of Indo-China requires to be told much about that. I went into this in detail, in a long article in *Asia*, in September, 1935, and the charges I made have never been answered by anybody. However, plenty of other foreign journalists had made similar charges. Indeed the state of the native peoples of Indo-China was the subject of sharp debates in the French Chamber of Deputies, in 1935, between the French Colonial Office and a deputation of French residents of Indo-China who had made the journey to France in order to present the case of the ruthlessly-exploited people.

Dawn of the New Era

When the new government came into power in Thailand its first endeavors were to do something for the commoners. These, 12,000,000 or so, are mainly agriculturalists, rice-growers, and their production ranks among the world's highest grades. But the industry was, to all intents and purposes, in the hands of the Chinese. They owned the rice-mills and their middlemen bought the rice from the growers to sell to the mills. The result was that the mills and the middlemen made 75 per cent of the profit from the rice crops, and the natives got the rest.

The new Thai regime undertook to free the Thai people of these economic shackles and bitter has been the resentment of the Chinese thereat. It has implemented itself in all sorts of anti-Thai propaganda and endeavors to alienate from the Thais both England and America. It has pretended that the Thai restriction against Chinese sending money out of the country in large sums is a Japanese-inspired measure to keep aid from the home country in its struggle with Japan. The fact is that the restriction measure was decreed in 1936. But in any case it has done very little to curb the Chinese along these lines, because during the past four

years they have sent home more than 10,000,000 of dollars in Chinese currency.

Now, then, when the Thais, deeming the time ripe and being too little discerning to perceive the certain consequences, decided to make another demand for frontier rectification they submitted this intention to both London and Washington. I make this assertion categorically because I happen to be in a position to be sure of its truth—and my informants were not primarily Thais either, though they confirmed it later.

The submission was made through the diplomatic representatives of the two great Powers in Bangkok, and both in due time told the Thais that their Governments "disapproved of any attempt to alter the *status quo* at this time, the Asiatic position being so delicate."

It had been a little delicate for the Thais more than once in the past, you could fairly say. In any case, Deputy Foreign Minister Nai Direk Tainam, Spokesman for the Foreign Office with visiting diplomats and newspapermen, assured me that not until after this did Japan come into the political picture at all. Mind you, I am in no measure vouching for the truth of that statement, I am merely giving you the Thai side. I am presenting to you certain facts, incontrovertible historic facts, as above. The rest is stated with reservations. Time will determine the truthfulness of the things I was told by the Thai Ministers and that soon. They assured me that they had at no time entered into commitments of any sort with anybody. Japan had neither suggested nor in any way implied that if Thailand accepted the mediation proposition that mediation would favor her. Least of all had Thailand made any promises to Japan in respect of "services rendered" in the mediation decision.

To Get Back Their Own

According to the Thais, and plenty of foreigners in the country sympathetic to them, what happened was simply that the new Thai regime, less supine in the face of abuses and affronts and bare-faced territorial thefts than the old medieval absolutist set-up, had determined on aggressive action in the matter of this long-standing boundary dispute. They would recover some at least of the lost territories even if they had to fight for them. True, their chances of success along such lines would have been nil before. The time was now ripe. And if anybody felt disposed to criticize the Thais for taking advantage of a broken France, why, Thailand just reminded them of French depredations against a small and helpless country during more than 75 years.

So the fighting started and the Japanese presently, "for the sake of increasing their prestige in south-east Asia," came along and proposed the mediation, and Thailand accepted it. That is the Thai case in a nutshell—according to the Thai Ministry at Bangkok. There may or may not be a good deal more to it than that. But it is only giving Thailand a fair deal to present to the world her case as she herself puts it.

All manner of asinine yarns have been spread about as to what is happening in Thailand, how rapidly she is becoming a "mere pawn of Japan." Nothing particular need be said about the sources of most of that sort of thing. I even read the other day that the Japanese were already at work on the long-touted canal across the Kra Isthmus. The British in the Malay States didn't seem to know anything about it, though, when I was through there a couple of months ago, and they would have been somewhat interested.

The Japanese Bogey

Also it has been alleged that the Japanese have military bases in several parts of Thailand, "advisors" in the Government, and so on. There was not a word of truth in any of it when I was in Thailand in March. And the only sign I encountered, or that had been encountered by anyone I met, mariners of the region included, of the "huge Japanese fleet in the Gulf of Siam and off the Thailand coast" was three Japanese destroyers, and these have been cruising about the Gulf for a long time. One came up to the town while I was there, loaded supplies and left within 48 hours. I was told by somebody that she had brought more than 800 "civilians" to be landed in Bangkok, but I could discover no sign of them. While I was in Bangkok I saw exactly five Japanese. They were from the Yokohama Specie Bank and lunched at the Oriental Hotel where I was staying. I asked Direk Tainam how many Japanese there were in Thailand. He said about 300. Other

people said 10,000. In the city itself there are fifteen Japanese commercial houses but most of their employees are Thais, Chinese and Indians. There are a number of small places, a Japanese barber-shop or two, a couple of Japanese hotels, things of that sort.

Mind you, I am discussing the position as it was when I was in Thailand in March, and as of that time that position was exactly as I have said. I do not know what it may have become since or what it will become, nor do I vouch in the smallest degree for the truth of what the Thai Ministers told me. As to some of it, I personally believe it, as to some more I prefer to wait and see. I was assured that Thailand would never yield anything in the way of territory, military bases or anything of the sort, to anybody "under any circumstances." As to that, we must all wait and see.

After all is said and done, however, the impression any fair-minded person, any really objective observer, gets in Thailand is that the Thais ask more than anything else to be let alone, in order that they may continue the remarkable material progress that has been achieved since the inception of the new constitutional regime. That progress has meant much to the common people. The present Government, moreover, is trying, by education and other means, to pull them out of the slough of indifference and sloth they were in during the last years of the old feudal monarchy which had little or no interest in their welfare so long as their taxes kept the privy-purse full.

When you ask the Thais how they feel about Japan, whose economic penetration has of course been very marked through the past twenty years or more yet has not begun to rival England's economic influence, they say "we appreciate Japan's aid in getting back a little of the territory that was stolen from us by France." I don't know that you can blame them very much for feeling that way.

New "Caterpillar" Models

To round out its popular line of Diesel Electric Sets, Caterpillar Tractor Co. has announced two new models, the 88-41 and the 77-34.

Both units are powered by four-cylinder Diesel engines. The 88-41, with a bore of 5 $\frac{3}{4}$ -in. and an 8-in. stroke, develops 41 kw. at 900 r.p.m., when equipped with radiator fan. Without fan, kilowatt rating is 44.

The 77-34 has a bore and stroke of 5 $\frac{1}{4}$ -in. by 8-in., and develops 34 kw. at the same r.p.m. when equipped with fan. It is rated at 36 kilowatts without fan. Both ratings are for the polyphase, 60-cycle set. Single phase ratings are slightly lower.

The sets are completely self-controlled, requiring no gadgets other than a circuit breaker. They are easy to install, and can be set up and running in less than an hour after delivery. Inbuilt regulation enables the sets to pick up relatively large motor loads with a minimum of light flicker and voltage drop.

Because of the wide application of these sets, maintenance problems have been simplified by having the entire unit serviced by "Caterpillar" distributors. They are designed to be operated by personnel without special training.

There are only three operating adjustments on the engines, and none of these involve the fuel system. The generators are direct-connected, rotating field type, available as 3-phase or single phase, 60-cycle or 50-cycle, and with a wide variety of voltages.

Japan's Merchant Marine

"Japan's shipping industry to-day ranks third in the world. Tonnage according to Lloyd's at the end on June, 1939, was:—

Britain	..	..	..	..	17,891,134
U.S.A.	..	..	..	..	8,909,892
Japan	..	..	..	..	5,629,845

Japan has a small but rapidly growing fast passenger fleet; she is developing fast cargo liners; she was the pioneer in fast tankers; heavy subsidies have been paid by her Government which has strict control; large amalgamations have been formed. These are some of the interesting points brought out in East Asia Economic Intelligence Series No. 6, *The Shipping Industry of Japan*, published by the Foreign Relations Council of the Japan Economic Federation, pp. 32, 1s. 4d.

Singapore's Other Problem

By WILLIAM HOSAKAWA

IN the dim, forgotten past of just a few weeks ago, it was popularly claimed that a Soviet-Japanese non-aggression pact would be Japan's green light for a swoop down to Singapore and the Netherlands Indies. Japan got her pact. She still has not made her expected swoop. Her leaders have remembered their promise, so far, not to use force in the program of southward expansion and not to attack any part of the British Empire.

Yet interest focuses on Singapore, citadel of British imperialism in south-east Asia, the key to the lifeline through Suez, past India, and down to the Dominions of Australia and New Zealand. Fortress, colony, market-place, Singapore figures more prominently in world events to-day than Sir Stamford Raffles ever dreamed his little island would. More than a century and a quarter ago Raffles saw the possibilities of this swampy, malaria-ridden isle even if other Britons did not, and there by the combination of treaty and force that is the secret of Britain's 18th and 19th century imperialism, he founded the city of Singapore.

Singapore to-day is both a city and an island. The city lies on the southern portion of an island roughly 20 miles long and 15 miles wide. The island is a pin-point on the map, a tiny speck that clings to the long pointed bottom end of the Malayan peninsula, some 80 miles north of the equator. There in the tropics, peopled by the polyglot races of southern Asia, has risen a clean, modern city under theegis of the British.

While the potentialities of Singapore as a naval base were realized long ago, there was no need for a major station in that part of the world until after the World War. Then, as Japanese naval power increased and Britain declined to renew her alliance with Japan, a base became essential for the protection of Britain's far-flung Far Eastern possessions. Actual work on the Singapore base started in the early 1920's, and the base itself was not completed until 1937 when a squadron of American cruisers despatched to Malaya took part in the opening celebrations.

Vast Defense Preparations

Since then, and especially since the tense summer of 1939, work has been rushed to make Singapore the fortress as impregnable as human ingenuity can make it. To all practical purposes the entire island is one great fortress. The naval base proper is located on the northern end of the island exactly opposite the city. The channel to the base, the Straits of Johore, is about a mile in width,

narrower at places, and the base itself is visible from the Johore shores. Connecting Singapore island and the Johore mainland is a mile-long causeway which carries a railroad line and highway, but this has been mined and can be destroyed at a moment's notice.

At Changi, guarding the entrance to the Straits of Johore, is a Royal Artillery station. Changi probably has been re-enforced with heavy gun emplacements outside the original area, while the numerous little islands that fan out from Singapore are literally bristling with guns. Right at the entrance to the little bay that forms Singapore Harbor is the island of Blakan Mati, another self-contained fortress in itself. These are the land defenses that guard Singapore from approach by sea.

Scattered throughout the island are the oil tanks that may some day be called on to fuel the entire British fleet. These tanks are so numerous and so large that even the casual visitor driving about the highways that criss-cross the island cannot help but run into dozens of them. The main highway to Johore, a fine paved road that cuts straight through from Singapore city to the Causeway, is lined with huge tanks along one section with only the dense boughs of umbrella-like trees to camouflage them from possible bombers. The main air station is at Tengah, not far from H.M.S. Sultan as the naval base is known, but numerous smaller fields have been cleared from the jungle and the broad civil airdrome on the eastern outskirts of the city is under R.A.F. control.

The naval base, however, is the most important single defense objective in Singapore, and all other defense units are there to protect it. The base is a closely guarded, self-contained unit.

Most Singaporeans have never seen it. Visitors have to be satisfied with hearing unconfirmed stories about it, or catching distant and hazy glimpses of tall radio towers and huge cranes, capable of handling the biggest jobs on British capital ships.

A frontal attack on Singapore is sure to provide tremendous hazards for any invader, although no capital ship is stationed there. The surrounding waters are mazes of minefields which, incidentally, have accounted for one big Norwegian freighter, one British passenger ship, one British naval tender, perhaps two dozen ocean-going Chinese freight junks, and provided narrow escapes for several small coastal ships. Aircraft stationed in Singapore are on constant patrol far out to sea, and they go far enough to insure that no hostile fleet will be able to creep up undetected during the night.



The Singapore fortified area showing its relation to the trade routes of the Far East

Pillboxes Ring Island

In addition to the heavy guns a string of concrete pillboxes rings the island. They were in construction long before the outbreak of the war in Europe, and by now they are well-camouflaged with grass on top, and the natural jungle growth around them. These pillboxes skirt the whole island, and are to be seen even along the wharves in Singapore harbor. Supporting these are barbed wire barricades and in the hills a system of trenches, useful but highly uncomfortable because of Singapore heat, rain and equatorial insect life. In the tense days of August, 1939, military officials called on all householders along the beaches, warned them that they might be required to move on quick notice, collected data on the value of properties in case they had to be commandeered, and actually requested certain households to move from homes located on vantage points.

In short, the defense of Singapore if and when defense becomes necessary, is roughly comparable to defense of the British Isles. Many of the same problems are encountered and many of the same tactics may be used in both defense and assault. The Johore shore would correspond to the French coast, the Straits of Johore to the English Channel. In Singapore's case, however, an enemy driving down the Malayan peninsula which could get as far as the Straits of Johore could make a shambles of the naval base. Any attacking force would drive on Singapore from both land and sea, making a landing first on the lightly defended Malayan coast.

Hitler has said that there are two ways of making war on the British Isles. One way would be quick and costly—direct assault. The other would take longer and the toll on manpower and military equipment would be less—air and naval blockade. The same two methods could be applied to Singapore, and the second would be much more effective in Singapore than it would be in Britain. This poses Singapore's other problem.

Singapore and Malaya are not self sufficient in food. When the war first started huge stocks of rice were laid in, but even rice does not keep well in the damp climate. This rice had to be imported, by ship, from French Indo-China, Burma and Java. Pork has to be brought in from Sumatra and Java, fruits from the same places. If Singapore Island were isolated from the Federated Malay States the food situation would soon become critical. A hostile fleet could wreak havoc with the transportation of vital food products which must be supplied constantly. While huge stocks are reported to be in naval cold storage godowns for the fleet that may some day be based in Singapore, there is no way to provide for the more than half million Asiatics who make up the vast bulk of Singapore's population.

Together with the question of food is the question of morale. No one questions British courage. The Britons have shown their mettle time and again, in London and elsewhere. But the Chinese, Indians and Malays of Singapore are not Britons, they do not believe in the cause so devotedly and completely as European Britons, and many of them have no cause to love the British. If conditions become serious the British in Singapore face internal trouble every bit as ominous as a hostile invading force.

The Internal Situation

This danger is perhaps the fruit of any imperialistic policy. The French in Indo-China were not loved in many cases by the natives, and the recent trouble there with first the Japanese and then the Thais gave them ample excuse to turn on Frenchmen. The instances of revolt were not isolated. In Singapore there are some 80,000 Indians of all tribes, and most of them are firm supporters of the Congress movement. They believe in Mahatma Gandhi just as passionately as their cousins back in India. So far the British have not taken the iron-handed measures with Indians in Malaya that they have in India proper. But still it is not healthy for Singapore civilians, especially Indians, to become too friendly with Indian Army officers stationed in Malaya. The Special Branch of the British Police system which is the political division is well-organized and assisted by a large corps of informers, and too often in the past Indian Army officers have been under suspicion by the Imperial authorities. During the World War Indian troops in Singapore revolted, shot their British officers, and threatened to kill every white man in sight. Japanese naval units cruising to the vicinity helped put down the uprising, and the mutineers were shot publicly. Neither the British nor the Indians have forgotten.

The authorities are careful to keep a safe numerical ratio between British and Indian troops.

Then there are the Communists. Last May Day they staged a number of well-organized riots all over the city. They foment strikes among the Chinese and some of them have turned out to be bloody affairs with many cracked heads and pistol duels. Stringent bans have been put on the circulation and publication of subversive matter. The foreign-language press is rigidly censored—each page must be stamped by the official censor before it may be published.

The Chinese are another possible source of danger. The educated classes have been inoculated with British ideas outwardly at least, but the coolie class, which is vastly in the majority, have no reason to love the British who have allowed them to settle there. In the early days of the Sino-Japanese hostilities the British were lax about suppressing anti-Japanese movements. Organized boycotts were tolerated. Extortion of Chinese lacking in patriotism was never effectively checked and rioters were not vigorously prosecuted. Many are the Chinese who lost their ears to allegedly patriotic extortioners, but the badly intimidated victims of the slicing operations refused to press charges and the terrorists were not always apprehended.

As the pressure in Europe increased, Britain showed signs of conciliation with Japan. This move was climaxed by the Craigie-Arita agreement over the Tientsin blockade in July, 1939, and Japanese-British relations took a turn for the better. Consequently a more severe attitude was taken toward Chinese mobsters in Singapore at that time, but, the British had to learn a lesson. This anti-Japanism which had been permitted to grow in the Colony refused to be stamped out and it threatened to turn into anti-foreignism when the British authorities cracked down. Officials in some cases were openly defied. To old China-hands it was the familiar pattern they had become familiar with back in China.

The Chinese Factor

This is a danger that is present to-day as nearly a half million Chinese, firmly entrenched in Singapore's economic life as coolies, servants, retail shopkeepers, traders, merchants, financiers including the richest men in the colony, are in a position to upset the routine of the whole colony simply by non-co-operation. There has been loose talk of Generalissimo Chiang Kai-shek dispatching troops into Burma to help the British defend the country. Perhaps the Generalissimo would like to do the British a favor by helping them with his manpower, but the British are sure to decline. There are too many Chinese in Burma and adjoining Malaya already for Britain's security of mind should the Chinese ever decide to turn against them. This possibility is not so remote that British officials have overlooked it. To the contrary, they are painfully aware of it.

Of the Asiatic groups under British jurisdiction in Singapore the native Malays are probably the most loyal. They are a proud and faithful if indolent people, and their Sultans have always been on good terms with their British Advisers. They have been permitted to form their own regiments and there is even a Malay unit of the fleet in action sweeping mines in the Singapore area. Still, few Malays speak English even after more than a century of British domination. The Indians of Malaya and the Chinese have not been permitted to join the armed forces. The large Eurasian population of Singapore may serve in the Volunteer Force, but never in the R.A.F. It must be remembered, too, that the Asiatic's nervous stability is questionable in crisis, and there surely will be panic if bombs begin dropping on the flimsy native homes. There are no adequate shelters—although authorities are arranging for them in conjunction with the cheap housing program of the Singapore Improvement Trust—and the climate makes them scarcely feasible.

Observers in commenting on Singapore usually consider only the prospects of invasion or attack. Japan is the leading menace in their writings. In fact Japan was the unnamed "hypothetical enemy" against which Singapore blackouts and maneuvers were practiced even in peacetime. Against this danger there is a mighty fortress aided by nature which provides impenetrable jungle, swamps, heat and disease to hinder the invader. But the observers neglect all too often the more sinister although still potential danger that the fortress of Singapore finds present within, even before the first enemy plane casts its shadow over the island.

(Continued on page 123)

The Powder Keg and the Spark

By W. H. BROOK

WITHOUT pretending to be melodramatic, one can observe safely to-day that the Pacific situation is ripe for a first-class explosion. This month Japan got what she has been seeking, a pact with the Soviets designed to safeguard her northern mainland frontier if she wants to push south toward Malaya and the Netherland Indies. Among the many factors which will determine her decision is the position in Europe which, at this writing, doesn't look so good for the adversaries of Nazi Germany.

Simultaneously, conditions are favorable for re-examination, to use a favorite Tokyo expression, and readjustment of pending American-Japanese problems. At the risk of being called an appeaser, one might venture to appraise possible advantages for the American position in a troubled world if Washington with less hauteur and more suavity would give some indication of a desire to seek compromise and to avert conflict. This need involve no retreat from fixed principles, it would cost nothing and it would go far to safeguard the American position, to aid Britain, and to prevent the spread of the war into the Pacific.

Japan to-day is in a precarious position. Although her leaders have not given up all hope of reaching an understanding with the United States, they are not counting on it. Thoroughly committed in China, they have no choice but to carry on although realizing that they cannot continue to fight indefinitely Chinese manpower and the Anglo-American treasuries and arsenals. In such a position a gamble for all or none, with a reasonably good chance of winning, is a tempting proposition. If the odds improve—through sweeping German victories in Europe—Japan would be overlooking the chance to grab respite from a difficult position if she did not take the gamble. That is, unless Britain and the United States can counter with a better deal.

From the American viewpoint the problem is equally ominous. For almost all practical purposes the United States is at war. Only the remnant of technical neutrality holds her from belligerency. She has cast her future with the British Empire, and it is to her every interest that Britain shall win. Such slogans as "Arsenal for Democracy" are meaningless beside the towering truth that the United States has indicated her stand because her leaders believe they cannot remain safe and at peace if Nazi Germany is victorious.

Real Menace is in Atlantic

So far the steps taken under the Lend-Lease Bill are not nearly sufficient if the United States is to underwrite British victory. All of America's effort is needed in the titanic task of matching Germany's total war machine, and it is imperative that all of it be diverted to those channels if it is true that so much depends on the outcome of the European struggle. America's interests, then, are first and foremost in Europe and any other diversion is but a handicap.

To counteract this by no means insignificant American aid to Britain, Germany finds a perfect set-up in the Pacific. Japan wants America's understanding and friendship, but she has been constantly rebuffed over the hostilities in China. She needs only to be convinced that the end of Anglo-American power is the end of her woes. It makes good sense because Britain and the United States have indicated unmistakably that they are unalterably opposed to Japanese plans for a Far Eastern sphere of influence.

If this were strictly an Anglo-American and Japanese issue, the United States would have little to worry about. That was the situation prior to September, 1939. If war came Japan might take Hongkong, land in the Philippines, possibly grab Singapore and a few unimportant islands. But by then Britain and the United States would have a long-range blockade in operation, and ultimately the combined naval power of the two countries plus their respective resources would be too much for the people on the crowded, unproductive Japanese Isles and the still undeveloped Asiatic mainland.

Even under present circumstances experts regardless of nationality concede the United States ultimate victory even if she alone

tackled Japan. However, it is certain America would not win easily, for Japan's fleet ranks with the best. America could enter war in the Pacific with no assurance that it would be over in a matter of months. In the meantime the supplies so needed by Britain would have to be used to equip American forces first, and the stoppage of this stream across the Atlantic which will become more and more important as time passes, will have dire consequences on British strength. It would avail the United States nothing to defeat Japan in the Pacific, only to find that her biggest danger, on the Atlantic side, has been allowed to grow more threatening. Besides no one can say for sure that Japan is certain to lose.

How Japan Aids Germany

The seriousness placed in Germany on American aid to Britain can be seen in the Wilhelmstrasse's efforts to divert U.S. energies with a Pacific war. But even without war, Japan is in position to neutralize considerably this American aid. By a truculent attitude and a series of pinpricks, never serious enough to lead to war and endanger herself, Japan keeps the American fleet tied up in the Pacific. She keeps large numbers of British Imperial forces concentrated in Malaya, and necessitates sending American warplanes to the Far East instead of to Britain where they are so badly needed. Australia and New Zealand are forced to retain a larger portion of their war effort to safeguard their own shores.

This is Japan's rôle to-day. It benefits her but little, but it is of great assistance to Germany. It is a dangerous rôle for a misstep may bring the war that she does not want, and which the United States and Britain do not want, but which may become inevitable because of the situation being built up.

Yet, Japan sees little hope of abandoning this part. She has discovered through experience that her ambitions for a Far Eastern sphere of influence are incompatible with Anglo-American purposes, and she has run into their opposition at every turn. From her point of view she seeks nothing that other powers did not seize by force when they desired, and now as the only Asiatic world power, and outside of Thailand the only independent nation in all East Asia, she wants only to assert her leadership of areas in her sphere. While Tokyo may disclaim it and while parallels are inaccurate, her dream of Empire is more on the British than the German pattern.

It has been charged that it suits Anglo-American strategy to prolong the Sino-Japanese hostilities as a means of keeping Japan too occupied to figure seriously as a German ally. It should be pointed out as well that there is a more effective and long-range view of promoting British and American interests by helping to bring about a compromise peace in the Far East, a peace which both Oriental belligerents desire but neither will initiate.

Tokyo, having forwarded a compromise peace offer to Chungking sometime last fall, no doubt would welcome a sincere mediation offer which would recognize her actual position in China. Likewise, if Chungking were convinced that Britain and the United States wanted her to compromise, and a face-saving formula were provided, her leaders would go back to the task of rebuilding the old China together with the Nanking peace group.

While such a formula may be a compromise with ideals, it cannot be denied that in the backward Far East where democratic concepts are undeveloped, where the filled rice bowl is more vital than the right of franchise, an early peace is more humane, constructive and advantageous. And while any talk of compromise—especially with Japan which has such a low friendship rating now in the United States—may be difficult for the American people to digest, the question carried a step further provides some pertinent arguments.

The World Problem

The world to-day is faced by twin forces which menace the capitalistic system on which the democracies are founded. One, (Continued on page 131)

New Order's Testing Ground

By STAFF WRITER

ONE of the liveliest topics of discussion in the Far East to-day is Japan's New Order. It is something that never has been adequately defined, and few Japanese and even fewer foreigners claim to understand its precise meaning. Roughly, it embraces such things as Japanese leadership in the Far East in technical and commercial advancement, with a measure of political influence. But the Japanese are too intelligent to believe that they can ever enforce political domination over East Asia in general and the Chinese in particular as they are often accused of plotting to do, they can never enslave the Chinese even if they desired, and the commercial opportunities are large enough for all.

Unfortunately the Japanese attempted to apply their New Order principles to areas while the wounds of military exigency were still fresh, with the result that they were bitterly opposed by the natives and roundly condemned by third party observers. The New Order has found the going difficult when the ruins of a war still raging are still at hand.

Not far from Shanghai, however, there is a peaceful little town where the better aspects of the New Order have been applied, a sort of testing ground for the principles, and where they have been eminently successful. The place is the ancient, somnolent and yet industriously active walled city of Soochow about half way between Shanghai and Nanking. A visit to this peaceful, appealing, old-time beauty spot is revealing of what the New Order has come to mean to this particular bit of Japanese-occupied China.

To begin with, the Japanese had a reason for picking the city for the experiment. It fell to the Japanese with scarcely a shot being fired soon after the collapse of the Chinese defences around Shanghai late in 1937. A small unit of Japanese, unrecognizable in their mud-stained coats, walked through the city gates late one evening close behind a fatigue-drugged retreating Chinese column, and before the defenders knew it, the Japanese flag was flying over the city and key points were in Japanese hands.

Thus Soochow escaped the ravages of seige, and its inhabitants never tasted the bitterness of battle and forced entry by the little men in mustard brown. Unembittered, the natives were not unwilling to co-operate with the Japanese. The Japanese in turn barrack no troops within the city gates, and Japanese officers in uniform walk about Soochow unescorted, something they cannot do with safety even in Shanghai. The Japanese authorities permitted only a limited number of hand-picked Japanese to migrate to Soochow, and to-day there are only 2,000 Nipponese in a total population of more than a quarter million.

Consequently there has been no flood of Japanese retailers with their cheap products pushing native merchants from the best sites. The Daimaru department store, easily the outstanding retail establishment in Soochow, is the only big Japanese concern on the main shopping street. The store has provided employment for a

great number of local men and girls, and it is showing the way in modern display and merchandising methods. Since Daimaru merchandise is on a Yen basis, about twice the value of the Chinese dollar, most of the townsfolk cannot afford to trade there. It is understood the Daimaru has an annual deficit of some Y30,000, but the management is encouraged by the growing turnover, and the concern's other branches absorb the loss. The Daimaru is always well filled with Chinese window-shoppers who the management expects some day to purchase as often as they look.

The story of this Daimaru enterprise is an interesting one. It begins with Japanese business leaders connected with the China Affairs Board who approached a number of big mercantile houses to open a Soochow outlet. Most of them saw no future in there but Daimaru did. Daimaru, incidentally, was first established in 1711

near Kyoto, and besides its outlets in Japan proper it has branches located in Shanghai, Soochow, Wusih, Chinkiang, Nanking, Hangchow, Kiukiang, Hankow, Wuhu, Canton and Tientsin. These branches in China afford employment for 250 Japanese and 1,450 Chinese who are given the same promotional advantages and other equal treatment with the Japanese.

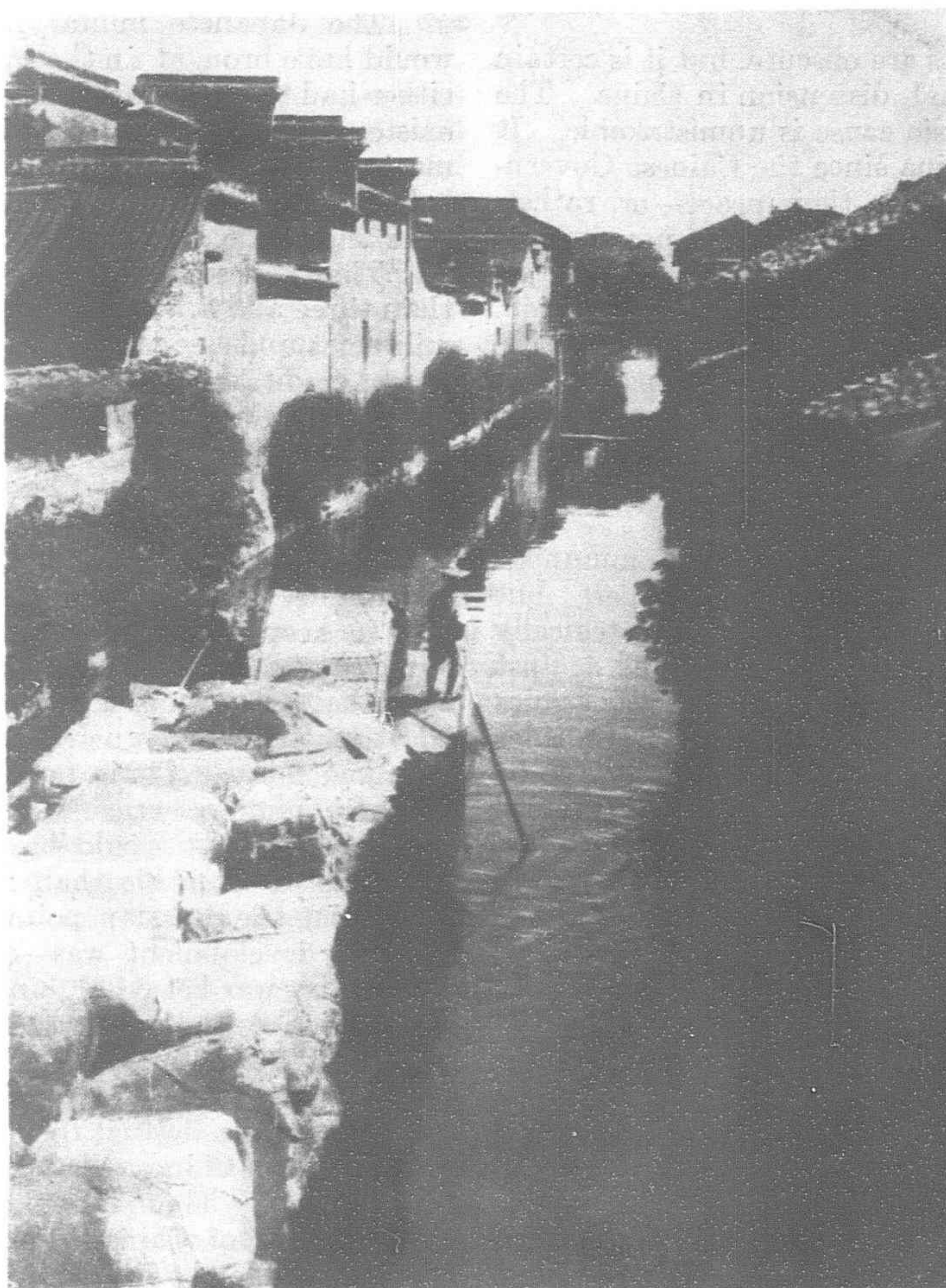
Daimaru directors began their Soochow project with the expectation of operating at a loss for the first ten years. They justified this apparently unbusinesslike decision with the objectives of (1) introducing Japanese goods at minimum prices; (2) improving local living standards; (3) Sino-Japanese understanding and mutual respect.

The present building, a Y200,000 four-story stucco structure, was built in the Market Place, replacing the ruins caused by the Chinese "scorched earth" policy. Rental is being paid to the owners of the land. There is now a monthly payroll of some Y20,000, and the total investment including building, stock and wholesale outlets is just less than Y1,000,000. The 260 Chinese employees get the customary Japanese bonuses in addition to their regular salaries. Their working hours are 8 a.m. to 6 p.m. with an hour for lunch, and two full days off each month. All girls are

given an afternoon rest period, and there is a smoking room, library, sun-room and game-room for all workers. The company purchases large quantities of rice and sells to employees' at cost. These conditions of employment, more favorable than any offered by Chinese concerns, has resulted on a large applicants list.

As part of the policy not to compete with Chinese shopkeepers, Daimaru sells few goods carried by them, and if there is duplication no price-cutting is attempted. Daimaru also has jobbing and wholesale service for local merchants. Goods are purchased in quantity lots in Shanghai and elsewhere, transported to Soochow, and sold to small shopkeepers at profits as low as one per cent. Chinese salesmen canvass the town to promote this service. These efforts have proven to the directors of Daimaru interests that Chinese people will patronize Japanese stores, and Chinese merchants will

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Famed for its poets and its three thousand bridges, Soochow truly is the Venice of China

The Shadow of Russia

By NATHANIEL PEFFER

(*Current History and Forum*)

RUSSIA is the unknown quantity in Europe. The unknown quantity in Asia is also Russia. Until that unknown quantity is known all judgments about the prospects and possibilities in the wars now raging on both continents must be conjectures only.

The weight of the Russian factor has been recognized in Europe since Molotoff signed the pact with Ribbentrop and Germany marched into Poland. In the Far East the Russian factor has been equally present in the political and military equations, but has become clearer by reason of two developments. The first is the recurrence of friction between the Chinese Communists and the Chinese Government. The second is the apparent progress in Russian-Japanese negotiations toward an agreement of some kind. The two are interrelated. Neither can be understood apart from the other.

With respect to the first, the facts are obscure, but it is certain that there has been serious internal dissension in China. The immediate cause is unclear. The basic cause is unmistakable. It derives from the schism latent in China since the Chinese Government and the Chinese Communists made their peace—or, rather, truce—on the outbreak of the war with Japan. The peace was a community of dislikes rather than a unity of purpose. The two sides were drawn together by resentment at the Japanese invasion. The Chinese Government was a nationalist government in title as well as sentiment. The Communists were anti-Japanese because they were Chinese and also because they were Communists. Neither liked the other, but both hated Japan. A partnership was struck, an uneasy and suspicious partnership, with reservations on both sides.

The government of Chiang Kai-shek wanted the Communists to carry on their guerilla warfare, in which they are expert; but it did not want them to entrench themselves in rich and strategically important areas. The Communists wanted, while fighting against the Japanese, to extend their area of operations, amass large armies and consolidate themselves in a regime of their own. Both sides battled Japan, but each intended at the moment of victory to be left supreme in China. Stripped of the intricacies of Oriental politics, this is the real issue which underlies the latest rift in China. If it were a purely Chinese issue, it might be settled simply and in any event would have no international repercussions. But it is not. It is a reflection of Far Eastern international politics.

Over the partnership between Chinese Communists and the Chinese Government has hung the shadow of Russia. In the first place, the Chinese Communist party was not simply a Chinese party, local to China. It took its inspiration and political guidance from Moscow. In the second place, Russia has a direct political stake in the Far East. Since Japan went into Manchuria, set up the puppet state of Manchoukuo and entrenched itself on the borders of Siberia, there has been an almost fatalistic assumption that Japan and Russia must again collide.

Japan feared the penetration of Russian doctrines into the Far East, especially by way of China. Russia feared the grandiose imperialistic designs of Japan. The Japanese triumphantly swept forward on the continent from 1931 to 1935. The Russians, alarmed, undertook the formation of what is now a powerful military establishment in Siberia, with its own troops, armaments and sources of supply. Even factories were built to free Russia's Far Eastern Army from dependence on the long haul from European Russia. By 1936 the two armies faced each other on the long borders of Manchoukuo and Korea. There were periodic clashes of outposts and for a time there was waged a large scale "unofficial" war.

In 1936 Japan concluded with Germany the so-called anti-Comintern pact. With Germany menacing in the West, the Russians were more than vulnerable against the Japanese in the East. It was elementary strategy to free themselves on one flank in order to confront the enemy on the other with their full power. Hope for security on the border facing a renaissance Germany was remote. It followed that security must be found on the

Asiatic border, and this could come about only if Japan were weakened by a third country. It is a Communist article of faith that America and Japan, both being capitalistic imperialisms, must one day clash; but that day seemed too far removed to relieve Russian fears. There was left only China.

In this respect the Japanese militarists played into Russian hands. They had already marked out China for their own, but by goading the Chinese into desperation had generated in China bitterness, passion and an unshakable resolve to resist. Unless the Japanese were prepared to scale down their aspirations in China there had to be a China-Japan war sooner or later. It was to Russia's interests that it be sooner. And Russia's emissaries in the Far East, official and unofficial, did their best to hasten the impending crisis.

The Japanese military, even without Russian intervention, would have brought on the war by their own efforts. The Chinese either had to fight, hopeless as the odds appeared, or to pass out of existence as a nation. There is no doubt that Chinese reluctance to meet Japan's challenge was diminished by the assurance of Russian help. There was a pathetic confidence that Russia would formally take their side.

The Chinese know better now. They have been at war more than three and a half years. Russia has given help in the form of military supplies—against cash or in barter for raw materials or on liberal credit, exactly as Great Britain, the United States and for a while even Germany have done. How much these supplies have amounted to it is impossible to say with accuracy. They have undoubtedly facilitated China's resistance. But that is as much as can be said—and it is far less than China had expected.

The reason lies in Russia's traditional political position and in Communist grand strategy. The Russians needed a Far Eastern war to keep Japan occupied, at least as long as Germany was dangerous. They wanted Japan to lose, if possible; but more than that, they wanted Japan exhausted. If Japan were exhausted, it mattered less whether Japan was victorious or defeated. If by some miracle China had been able to win a decisive victory in three months, crush Japan and emerge itself powerful and unassailable, that would have been deemed by Russia a reverse only less disagreeable than a Japanese victory.

From the Russian point of view the ideal direction of Far Eastern development was—and for that matter still is—a long destructive war between China and Japan in which Japan would be slowly depleted, then forced to withdraw from China and then collapse. At the end of the war China, too, would be left disorganized, helpless, under obligation to Russia and open to any advance Russia desired to make. Russia desires not a stalemate exactly, but a Chinese victory in which both victor and vanquished are prostrate. Then, if at the same time there were left in China a solid nucleus of Chinese Communist troops, strategically placed, China would fall to Russia. The leaders of the Chinese Communist armies could then govern as viceroys acting for Moscow or they could serve as the spearhead of Russian occupying forces. Meanwhile Russian "advisers," Communist party functionaries and secret police could filter in and begin the slow engulfing of government in China.

It follows, then, that Russia's help to China after the outbreak of the war with Japan would be limited to as much as was required to keep China from surrender. It would not be much as to assure a quick Chinese victory. And it would be given piecemeal, doled out as long as China behaved, that is, did nothing inimical to Russian interests.

Here one may have the key to the renewed friction between the Chinese Government and the Chinese Communists, and to the current negotiations between Japan and Russia. That such negotiations are in progress is certain. The Russians and the Japanese, in relation to each other, are in much the same position as the Chinese Government and the Chinese Communists. Each is ready to co-operate with the other at the other's expense.

Russia is trying to buy off Japan in case it must come to a break with Germany. Japan wants to buy off Russia so that it need not keep so large a part of its military force immobilized on the Siberian borders. If that force were freed Japan could concentrate either on finishing off China or sweeping southward over the colonial possessions of France, the Netherlands and Great Britain. Germany wants to bring Russia and Japan together in order that Japan may be free to embarrass Great Britain in the Pacific. But neither Japan nor Russia can be expected to conclude and keep an agreement which will freeze their present, involved relationship. And since neither has hit upon a stratagem for taking in the other, the long-rumored Russo-Japanese pact has failed to come off.

Meanwhile, Russia has a lever with which to move China. For one of the pre-conditions of a Russo-Japanese agreement, is that Russia cease sending supplies to China. Russia is thus able to threaten to make an agreement with Japan at China's expense unless China proves more complaisant, and the test of this complaisance is the treatment of the Chinese Communists. Now, it may be doubted whether Russia actually would cease sending supplies to China, regardless of what China did, because that would strengthen Japan. China must strike a delicate balance at concessions that will not entrench the Communist troops too powerfully but will nevertheless placate the Russians. So long as such a balance can be maintained, an open internal break in China will be avoided.

Whether Russia can obtain anything more from the negotiations with Japan than a means of exerting pressure on China is still doubtful. Japan, too, is using the negotiations as a means of exerting pressure on China. To implant in the Chinese government the belief that Russia will desert China might make the Chinese more amenable to the kind of compromise peace that Japan has long been offering, namely, a peace that leaves Japan in occupation of key points and in possession of basic resources in China.

There are two obstacles to a real Russian-Japanese understanding. The first is China. The second is the inherent incompatibility of Russian and Japanese interests and ambitions. If Russia under Stalin has abandoned the rôle of protagonist of the world dictatorship of the proletariat, if it has overthrown Marxism except in certain externals of domestic organization, then it might be willing to renounce China. In that case it could take imperialistic compensation elsewhere—India, Persia, Afghanistan and Asia Minor, for example. Otherwise China is still its best potential foothold, as Lenin, Trotsky and the early Stalin foresaw. Established in China, a revolutionary Communist state stretching from Poland to the Pacific might move glacially down through Asia and, by contagion, propaganda and threat across to the Persian gulf—provided the British Empire were dismembered and Germany were kept busy in Europe. Certainly, as long as Russia is undecided as to her rôle, China cannot and will not be renounced, least of all to Japan.

With regard to the second obstacle, there has been much talk about a "partition" of China into Japanese and Russian spheres of interest. Unfortunately for both Russia and Japan, and fortunately for China, there is no practicable basis for partition. Where shall the dividing line be? How can the spoils be allotted except by force or threat of force? There is no natural geographical barrier in China. If Russia gets the north-west only, it gets barren, impoverished land, is shut off from the sea except at the frozen port of Vladivostok and still has Japan on its flanks. Then from the point of view either of imperialism, or Communism, Russia has accepted defeat. If, on the other hand, Russia is allowed by Japan to stretch into the richer and more populous parts of China, then Japan is cheated. And, still more important, Japan has a militarized Russia entrenched on additional hundreds of miles of its own border. In that case, too, Russia has a common land frontier with China while Japan's strength must remain in its own territory across the sea unless it is permanently to maintain the larger part of its army on the continent. No division of the spoils in China is possible without dangerously exposing either Japan or Russia to the other. It is a position neither will accept, since neither can or will trust in the other's good faith.

All that can be said confidently of Russia's rôle in the Far East now is that it is very much like its rôle in Europe. In both continents, Russia is jockeying for favorable position after the war. Then Russia can use that position as it wills—either for the purpose of advancing the revolution or for the purpose of erecting a Eurasian empire on classical, pre-Lenin principles. Meanwhile Russia feeds

a little to Germany to keep Germany placated—and fighting against England. Russia gives enough help to China to keep the Far Eastern war going. For this must be re-emphasized: China, too, must not be allowed to become so strong that it will be invulnerable. And Japan is being stalled along with a concession here and there—as for example, on the fisheries off the Siberian coast.

But as Germany becomes ominous and reaches across Europe, Russia seeks to advance her bases along the Baltic and Black Sea so that their relative positions will remain the same. So, too, if Japan seeks to impinge on Outer Mongolia, for example, she is met with planes and artillery, as in 1939. Whatever happens, Russia has little to lose and may have much to gain—provided that all the combatants in both hemispheres are simultaneously exhausted and do not later wreak vengeance on Russia for her attitude to-day.

New Order's Testing Ground

(Continued from page 121)

not oppose Japanese business efforts carried on in an ethical manner.

While Daimaru sells Japanese manufactures almost exclusively, this is not true of other retail outlets. To belie the tale that cheaply produced Japanese products flood the markets of all towns under Japanese control, the native traders do a booming business in Chinese as well as foreign products. Candles by Standard Oil, toilet articles nationally advertised in American magazines, Del Monte and Campbell canned foods, Quaker Oats, American soaps and French perfumes are to be found in profusion in Chinese stores. Alongside these foreign products are cheap cotton goods and rubber articles produced in Shanghai factories far more economically than they could be made in Japan, while of course there are articles from Kobe, Osaka and Nagoya plants. Apparently there are little if any restrictions on foreign goods, and none whatsoever that make the sale of Japanese products compulsory. It appears to be a matter of buying what you like according to the price one can pay, with imported goods most expensive, Japanese goods next and flimsy native manufactures cheapest but of questionable economic value.

The food markets are liberally stocked with local products—fresh vegetables, sides of pork, poultry, fish—all at surprisingly low prices compared to Shanghai. There appears to be no shortage of rice and the all-round comfortably prosperous air in even the oldest sections is strange to one who expects a district trying to recover from the ravages of a major war. Streets are being widened and cobblestones are replacing mud. Sewers are being laid and piped water is being made available in wider areas. The public utilities are being put on a more efficient basis.

Not all the answers to objections to the New Order are to be found in this city of course, but enough impressive arguments are actively being practiced to convince the observer that the New Order under ideal conditions is a pretty good thing. Anyhow, a good many Soochow people think so. They're only two hours from Shanghai by train, less than a day by canal barge, yet they've never been down to the metropolis and they aren't interested. They're quite happy where they are, with Wang Ching-wei in Nanking as their president.

Singapore's Other Problem

(Continued from page 119)

Britain, without doubt, has made no technological and strategic oversight in the defense of a vital Empire link. Yet the presence of more than a half million Asiatics, most of them without special devotion to the Empire nor for democracy which they have never known, and some of them bitterly opposed to all British policy, is a factor that cannot be discounted. This situation is fundamentally different to that which the United States faces in Hawaii, for the large Japanese and Chinese population there enjoy equality of treatment and all the rights of citizenship and are unquestionably loyal to America.

Fortunately for Britain, this mass of humanity, much of it illiterate and most of it working on a bare subsistence standard, shows no open signs of revolt yet. Nor is there apt to be an explosion until Britain loses considerably more "face" or experiences severe military set-backs. But the force of the eruption of this still somnolent human volcano, if and when it comes, is sure to be considerable.

Burma's Mineral Resources and the War

By Sir LEWIS LEIGH FERMOR, O.B.E., D.S.C., A.R.S.M., M.INST.M.M., F.R.S.

(The Asiatic Review)

IN the previous paper I gave an account of "India's Mineral Resources and the War." Had that article been written prior to April 1, 1937, it would also have dealt with the mineral resources of Burma. On that date, however, Burma was separated from India and given a separate administration. As one result, India, from the geological point of view one of the most natural geological units on the surface of the earth, has lost a limb. This natural unit comprises the geologically ancient Peninsula of India—the northern end of which is overlain by the Indo-Gangetic alluvial deposits—and the three, geologically young, bordering mountain festoons or series of festoons, the convexities of which are directed towards the Peninsula, as if these mountains had been pushed against the edges thereof. These festoons comprise the arcs of Baluchistan and the North-West Frontier on the west or left as one faces the map, the Himalayan ranges on the north, and the Assam-Burma ranges on the east or right, the latter including the Tenasserim extension towards Malaya. It is of the portions of this eastern arm comprising Burma that India has been deprived.*

Prior to this separation the Geological Survey of India included Burma in its sphere of operations, an inclusion that was advantageous to both countries, for geological and mineral data secured in India are helpful in the understanding of Burma, and vice versa. Fortunately, it has been found possible for geological work in the two countries, after separation, to remain associated. A Burma Geological Department has been formed, which is at present staffed by officers lent from the Indian department; and the results of the researches in Burma are published in the *Records of the Geological Survey of India* as before. This arrangement has a twofold benefit for Burma, for the small staff that Burma can afford is supplied and replenished from a relatively large reservoir of geological experience, whilst the results of research in Burma are given wider publicity than otherwise. As one result of this arrangement the annual mineral statistics of Burma are still published by the Director of the Geological Survey of India, but the Burmese figures are now segregated from the Indian figures.† To the statistician this is of great value, as all the previous Burmese mineral statistics have been published in the Indian *Records*, though in an unsegregated form.

Although a portion of Burma may be regarded as belonging to the Indian geological unit, the eastward extension into the Shan Plateau has no parallel on the western side of India—i.e., in Balu-

chistan—whilst the southern, Tenasserim, extension also has no parallel on the western side of India, but connects with Malayan geology. It is not surprising, therefore, that, whilst some of the valuable minerals of Burma have their Indian parallel (in particular the petroleum deposits), there are others that have no such parallel, especially the silver-lead deposits worked by the Burma Corporation at Bawdwin in the Northern Shan States, and the tin and wolfram deposits of Tavoy and Mergui in Tenasserim, these latter forming a northern extension of the Malayan tin and wolfram belt.‡

On the other hand, as Burma is geologically but one arm of India, it is not surprising that she is poor in the minerals characteristic of the body thereof—namely, the Peninsula of India. The Ruby Mines Tract and some other tracts in Upper Burma may be comparable in age with certain Indian Peninsular formations, as is also the Loian coalfield in the Southern Shan States; but they are poor in Peninsular materials, for the rubies and other gems of Mogok have no economic parallel in India proper, though they occur in Ceylon, which is geologically a part of the Indian Peninsula: whilst the Loian coal is crushed.

In view of these geological differences, we must expect the mineral production of Burma to differ in many items from that of India.

In the previous article I mentioned that almost any mineral has some war use, direct or indirect—for example, stone suitable for constructional purposes and for the manufacture of cement, and limestone for fluxing in metallurgical industry. But it was then decided not to treat such minerals as these, and also many other less important minerals, as war minerals, restricting our study rather to the minerals required in the manufacture of armaments and for transport purposes. Such mineral resources were grouped under ten heads, according to their use; and, from the information given then, it will be seen that India has valuable mineral resources under all ten heads, although the minerals were not specifically allotted thereto.

*The southern end of this arm is, of course, British Malaya, separated from Tenasserim by a small tract of Siamese territory.

†They are also published separately by the Government of Burma, but not in a form that reaches so wide a range of readers and libraries.

‡It should not be forgotten, however, that the Straits Settlements were once politically a part of India.

TABLE I.—QUANTITY OF THE MINERAL PRODUCTION OF BURMA, 1934 TO 1938

	1934	1935	1936	1937	1938	Mean, 1934-1938	Mean, 1914-1918
War Minerals :							
Petroleum (gals.)	254,760,070	251,338,974	265,570,120	274,664,365	263,823,265	262,031,359	275,268,745
Lead (tons)	70,560	70,560	71,915	76,500	78,900	73,687	14,763
Tungsten-ore (tons)	3,328	3,837	4,562	4,998	5,343	4,414	3,473
Tin-ore (tons)	5,801	5,860	6,495	6,622	6,303	6,216	(b) 599
Silver (ozs.)	5,792,019	5,825,913	5,952,000	6,180,000	5,920,000	5,933,986	966,301
Zinc-ore concentrates (tons)	68,838	78,590	76,807	73,552	60,744	71,706	2,395
Copper-matte (tons)	11,000	8,950	7,500	7,750	5,900	8,220	(c) 459
Nickel-speiss (tons)	3,951	4,850	4,325	4,020	3,015	4,032	—
Salt (tons)	36,976	40,086	32,272	53,813	38,698	40,369	39,059
Antimonial lead (tons)	1,255	1,500	1,240	1,150	1,200	1,269	(d) 234
Gold (ozs.)	890	1,483	1,439	1,004	1,209	1,205	2,024
Iron-ore (tons)	23,930	23,085	26,316	25,426	18,050	23,361	21,302
Bismuth (lbs.)	—	224	112	246	nil	116	—
Molybdenite (cwts.)	—	—	—	—	—	—	8
Platinum (ozs.)	—	—	—	—	—	—	14
Non-war minerals :							
Building materials (tons)	2,237,440	1,530,969	2,065,352	3,126,587	2,545,098	2,301,089	982,155
Ruby, sapphire and spinel (carats)	21,775	105,642	155,553	161,700	212,827	131,499	225,672
Jadeite (cwts.)	2,094	1,265	1,671	2,952	1,303	1,857	4,651
Clay (tons)	21,213	25,898	20,355	18,092	18,066	20,725	7,738
Soapsand (tons)	6,174	9,525	15,015	(a) 19,224	(a) 9,616	11,910	—
Amber (cwts.)	4	19	32	39	—	19	18

(a) Estimated from value.

(b) Includes some block tin.

(c) Copper-ore.

(d) Antimony-ore.

Burma, being but one arm of the geological unit, has not as wide a range of minerals as India; nevertheless, on comparing with these ten groups the list of minerals produced as shown in Table 1, it will be seen that Burma produces minerals belonging to no less than six of these groups:

- (1) The fuels: petroleum.
- (3) Metallic ores required for the manufacture of ferro-alloys and special steels: ores of tungsten (wolfram), nickel, and molybdenum.
- (4) Metallic ores needed for other military purposes: ores of copper, lead, zinc, and tin.
- (5) Gold and silver.
- (7) Abrasives: rubies.
- (9) Materials suitable for chemical industries: salt and also sulphides.

Burma has also certain possibilities under (2) of development of hydro-electric schemes, to which the Burma Corporation has paid some attention.

We must now survey briefly the mineral resources of Burma in order to see what contribution Burma makes or can make to the British output of essential war minerals. In war-time it is the developed minerals, or those susceptible of easy and early development, that are of the greatest importance, so that a study of the statistics of mineral production will furnish us in the main with our answer.

In Tables 1 and 2 I have collected the statistics of production for the five calendar years immediately preceding the present war—namely, 1934 to 1938. The tables show also the averages for this quinquennial period and, for comparison, the averages for the quinquennial period, 1914 to 1918, of the last war. These figures are based on the annual and quinquennial reviews of mineral production published in the *Records of the Geological Survey of India*. In these reviews the Burma figures are shown separately from those of India from 1937 onwards. For earlier years I have had to separate the figures of the two countries. Table 1 shows the quantities of the minerals produced, and Table 2 the values thereof in terms of sterling at appropriate rates of exchange. The order of arrangement is, as in the previous article, that of values in the latest year, 1938. The minerals are classified into war minerals and non-war minerals. In the Indian tables the non-war minerals, with the exception of building materials, were grouped as "other minerals," on account partly of their number. Since with Burma they are few in number, it is possible to show them separately. In the Indian tables the relatively small quantity of

silver recovered as a by-product on the Kolar gold-mines has been included under non-war minerals—"other minerals." The output of silver from Burma is, however, so large and its value relatively so high that this value must have a war significance,* and in this study I have included silver under war minerals.†

I should have liked to give, in the respective articles, the figures of production for India and Burma in 1939, but at the time of writing these data have not been received in England.

In presenting the figures of mineral production of a country there is always the difficulty of deciding at what point to report the output, especially the value thereof. Quoting the Indian article:

"Should one give the output of raw mineral, or that of the finished products, in cases where a mineral is subjected to chemical or metallurgical treatment before use or export? As the value, in the latter case, includes the cost of industrial processing, it is simpler to report the mineral before treatment, except such concentration as is necessary to fit it for transport, and this course has been adopted."

In the case of Burma this procedure is not feasible with reference to the products of the Burma Corporation from its milling and smelting operations at Namtu in the Northern Shan States—namely, metallic lead, antimonial lead, and silver, copper-matte, nickel-speiss, and zinc-ore concentrates. A value is reported for the lead-ore mined, but no value is expressed for the contained silver and the associated zinc, and no value is given for the associated copper and nickel minerals. Hence for these products it is simplest to record the quantities and values of each after separation and in the form in which it leaves Namtu—namely, as metal in the case of lead, silver, and antimonial lead, and as intermediate product in the case of the other three metals, for they are exported

*Especially if we remember the extent to which China has financed her struggle with Japan out of the proceeds of the sale of silver.

†On this account it seems desirable here to give the Indian silver data, for the benefit of those who may wish to modify the Indian tables accordingly:

		Ozs.	£
1934		25,505	3,121
1935		24,493	2,930
1936		25,345	2,528
1937		24,642	2,432
1938		22,295	2,230
Mean, 1934-1938		24,456	2,648
Mean, 1914-1918		865	85

TABLE 2.—VALUE OF THE MINERAL PRODUCTION OF BURMA, 1934 TO 1938

	1934	1935	1936	1937	1938	Mean, 1934-1938	Mean, 1914-1918
<i>War minerals:</i>	£	£	£	£	£	£	£
Petroleum	3,629,852	3,749,135	3,736,805	4,474,147	3,766,810	3,871,350	1,025,053
Lead	787,859	1,010,414	1,269,262	1,801,719	1,226,913	1,219,233	358,469
Tungsten-ore	284,956	296,693	307,624	603,214	607,424	419,982	461,698
Tin-ore	764,688	763,081	780,689	824,001	589,042	744,300	(c) 73,300
Silver	559,736	766,524	516,660	553,458	513,670	582,010	135,844
Zinc-ore concentrates	201,309	285,666	303,356	409,054	229,698	285,817	5,526
Copper-matte	165,404	199,715	151,126	181,839	120,230	163,663	(d) 881
Nickel-speiss	86,401	105,269	111,489	104,590	82,561	98,062	—
Salt	40,144	39,925	37,257	62,026	44,329	44,736	188,630
Antimonial lead	15,617	27,065	26,036	31,652	22,096	24,493	(e) 157
Gold	4,756	8,689	7,820	6,333	7,846	7,089	7,866
Iron-ore (a)	7,197	6,943	7,915	7,647	5,388	7,018	5,682
Bismuth	—	16	8	(b) 18	—	8	—
Molybdenite	—	—	—	—	—	—	178
Platinum	—	—	—	—	—	—	76
Total	£6,547,919	£7,259,135	£7,256,047	£9,059,698	£7,216,007	£7,467,761	£2,263,360
<i>Non-war minerals:</i>							
Building materials	149,328	120,995	158,211	194,550	183,182	161,253	68,779
Ruby, sapphire, and spinel	2,733	8,601	7,319	7,069	11,006	7,346	41,817
Jadeite	12,501	14,522	13,412	13,030	4,320	11,557	74,498
Clays	1,669	2,116	1,540	1,367	1,477	1,634	529
Soapsand	637	763	1,092	1,602	801	979	—
Amber	12	158	409	668	—	249	280
Total	166,880	147,155	181,983	218,286	200,786	183,018	185,903
Total, all minerals	£6,714,799	£7,406,290	£7,438,030	£9,277,984	£7,416,793	£7,650,779	£2,449,263

(a) Value estimated at Rs. 4 per ton.

(b) Estimated.

(c) Includes some block tin.

(d) Copper-ore.

(e) Antimony-ore.

in the unfinished condition as copper-matte, nickel-speiss, and zinc-ore concentrates respectively. These values cover, therefore, the costs of smelting, including that (1) of the coal or coke imported from India for this purpose; (2) of the whole of the iron-ore to which a value is allotted separately in Table 2, for this iron-ore is used as a flux at Namtu; and (3) of a portion of the limestone included under building materials, also used as a flux. To give an idea of the enhancement in the total value of the Burma mineral production that thus results it is sufficient to mention, using the data of 1938, that, whereas the values entered for that year for metallic lead, silver, and antimonial lead amount to a total of £1,762,679, the value of the lead-ore from which these metals were obtained is recorded as only £471,201. The value allotted to copper and nickel would be seen to be similarly enhanced if the value of the crude ore were known.

In the Indian article I was able to exclude the smelted products from the tables of production, relegating to a separate table the value of a portion of these products. Since, in the case of Burma, it has proved necessary to include smelted products with the mineral production, it follows that the corresponding tables for the two countries are not strictly comparable, and that the value of the Burmese production is relatively enhanced. It may be estimated from such data as are available that the Burmese figures are swollen in this respect to the extent of some £1.4 to £1.5 millions for 1938, and that a correction of this magnitude would make the figures for the two countries crudely comparable. On this basis the total value of the mineral output of the two countries in 1938 would be £17,780,000 for India and some £6,000,000 for Burma; or, more fairly, 1938 being an exceptionally good year for India and only an average one for Burma, we may compare the quinquennial average values for 1934-1938—namely, £13,609,000 for India and £6,200,000 for Burma.

Let us now discuss Tables 1 and 2, arranged, as stated, in the order of value of production in 1938. In these tables the minerals of direct war value are shown in the upper part of the table, and those of lesser or no war value in the lower part.

First let us compare the quinquennial averages of 1934-1938 with those of 1914-1918. This will show us the extent to which the mineral industries of Burma have expanded since the last war and give us an idea of the increased mineral ability of Burma to help in the present war. We see, first, that the total average annual value of war minerals has increased from £2,263,360 in 1914-1918 to £7,467,761 in 1934-1938, whilst the total value of all minerals has increased from £2,449,263 to £7,650,779 in the same periods, a threefold expansion.* Comparing the production of the two periods mineral by mineral, and now noting quantities instead of values, we see that, with the exception of petroleum, gold-molybdenite, and platinum, in the case of war minerals, and rubies, sapphires and spinels, and jadeite, in the case of non-war minerals, increases are shown by every mineral, often of very great extent. Specially noteworthy are the increases in the output of the products of the Bawdwin mines, smelted at Namtu by the Burma Corporation, from an annual average of 14,763 to 73,687 tons of *lead*, from under one to nearly six million ounces of *silver*, and from 2 to 71 thousand tons of *zinc-ore concentrates*; with the production of over 8,000 tons of *copper-matte*, 4,000 tons of *nickel-speiss*, and 1,200 tons of *antimonial lead*, where none was produced before. Important also is the increase in the annual output of *tin-ore* (concentrates) from some 600 to over 6,000 tons, due partly to the development of that great producer of both tin and wolfram, the Mawchi mine in Karenni State, but helped also by the beneficial exclusion† of Burma from participation in the International Tin Control Scheme. The increase in the output of *wolfram* or *tungsten-ore* from one period to the other was a moderate one—namely, from an average annual of 3,473 to 4,414 tons, about 27 per cent. But the Burmese wolfram production of 1914-1918 was itself a high one, the second in the world, stimulated by the war; thereafter the wolfram industry relapsed to a condition of relative stagnation, and in the quinquennium 1929-1933 the average output from Burma was only 2,355 tons. It must be considered, therefore, as highly significant—and as probably another portent of the present war analogous to that of the German aluminium statistics mentioned in the preceding Indian article—that in the five years prior to the present war the Burmese wolfram production should have shown a continuous increase (see Table 1) so as to give the foregoing increased average annual production and an actual output in 1938 of 5,343 tons.

Turning to the decreases, we may note at once that the small relative fall in the output of *petroleum*, though doubtless related to declining output in some fields, is partly due to the interests of the most important company, the Burma Oil Company, in the production of its subsidiary, the Assam Oil Company, at Digboi in India; and it will be seen, on comparing the two sets of figures, that the Burmese decreases are more than offset by Indian increases. It must be remembered that India provides the main market for Burmese petroleum. *Gold* shows a moderate proportionate decrease from an annual average of some 2,000 ozs. to some 1,200 ozs., though the fall in value is proportionately much less, owing to the increase in the sterling price of gold. The gold production of the earlier period was due mainly to operations in the Irrawaddy River of the Burma Gold Dredging Company. This company ceased work in 1918; the Burmese output then relapsed to the trivial annual figures due to the native gold-washers, but increased again suddenly in 1934 with the production of gold by the Burma Corporation, presumably as another by-product of the smelting operations at Namtu. The cessation of the small-scale production of *platinum* won in the earlier period is also due to the stoppage of the Burma Gold Dredging Company, of whose operations it was a by-product. The small quantity of *molybdenite* won in the last war was a by-product from the active search for wolfram.

Of the minerals classified here as non-war minerals the principal decrease is in the output of the precious stones—*ruby*, *sapphire*, and *spinel*—due to the cessation of the operations of the Burma Ruby Mines, Ltd., in 1931. The stones now being produced are won under extraordinary licences by small workers. It is noticeable that the decrease in the reported value is much greater than the fall in quantity, indicating a fall of average quality. There is also a very substantial fall in the output of *jadeite*, due to the war in China, the Chinese normally taking practically the whole of the Burmese production of this mineral.

We will now refer briefly to each of the war materials shown separately in Tables 1 and 2, following the same order.

Petroleum.—Although petroleum shows a slight fall in quantity compared with the past, it is, nevertheless, Burma's most important mineral, from which large quantities of aviation spirit are obtained, other products including, of course, kerosene oil and lubricating oil, the major portion of the kerosene being exported to India.

Lead.—This metal is used in the manufacture of pipes, sheets, foil, and alloys, and also pigments, as well as having ordnance uses. In peace times a small portion of the Burmese lead goes to India and the major portion to foreign countries. This latter now becomes available to strengthen Eastern supplies.

Tungsten-ore.—Wolfram is Burma's most important war mineral, and during the last war Burma became the world's largest producer, with the exception of China; these two countries still occupy the two leading places. Wolfram is needed for the manufacture of ferro-tungsten and high-speed steel, a tungsten-steel that retains its hardness even though heated, and is consequently essential for tools used on high-speed lathes, such as in the turning of shell cases. For this reason, during the last war, Government took under control the wolfram industry of Tavoy to ensure that the mines were developed to the fullest possible extent; this control was exercised through a civilian officer, advised and assisted by a staff of three officers from the Geological Survey of India. It is fortunate that we have started the present war with the wolfram deposits of Burma as a whole developed to a greater capacity of production than in the last war. It may safely be assumed that war requirements will cause still further development.

Tin-ore.—The Burmese tin-ore concentrates are sent to the Straits Settlements for smelting, and finished metal goes thence to India, partly for the manufacture of tinplate by the Tata Iron and Steel Company, followed by conversion into kerosene oil tins by a subsidiary of the Burma Oil Company. Tinplate provides the principal world's outlet for tin, but in addition this metal is used in the manufacture of alloys, such as solder and bronze. In

*This comparison is partly vitiated by the fact that revised methods of valuation of petroleum and salt have been adopted since the earlier period, greatly enhancing the value of the petroleum (by nearly £3,000,000) and reducing the value of the salt (by nearly £150,000).

†Necessitated by the fact that many of the Burmese tin-ores are admixed with wolfram, so that one mineral could not be restricted without restricting the other.

addition, any surplus of metal for export outside the rupee-sterling area is a useful source of foreign exchange.

Silver.—Silver is mainly used for currency purposes; and, as India and Burma rely to such an extent on the silver rupee, this metal must be regarded as a war metal. Silver is also of use in the chemical, photographic, and electrical industries. During the two first years since separation Burma has exported 73 per cent of her silver production to India; but this formed only 15 per cent of the total retained imports of silver into India during these two years.

Zinc-ore Concentrates.—Spelter, the commercial form of crude zinc, is needed both for galvanizing and the manufacture of brass, as well as being used in sheet form. Zinc is also used in the preparation of zinc white and of certain chemicals. There is no zinc smelting in either India or Burma, and consequently the Burmese zinc concentrates are exported elsewhere for treatment. In return, spelter is imported into India, partly for use in the manufacture of yellow metal or brass by the Indian Copper Corporation, and partly for galvanizing. One untoward result of the export of zinc concentrates, which consist of sulphide of zinc, is that the by-product sulphuric acid, so essential for chemical industry and the manufacture of explosives, is recovered abroad instead of in either India or Burma.

Copper-matte.—The matte produced at the Namtu smelting works of the Burma Corporation contains (1938 figures) some 42 per cent of copper, 29 per cent of lead, and 72 ozs. of silver to the ton. It was formerly exported to Hamburg for further treatment, the contained sulphur being again lost to India and Burma. Copper is needed not only for ordnance purposes, but is, of course, an essential requirement of the electrical industries and in the manufacture of brass.

Nickel-speiss.—Nickel-speiss, another product of the Namtu smelters, was also exported to Hamburg for treatment. The composition, as reported for 1938, was some 31 per cent of nickel, 8.6 per cent of copper, 6.7 per cent of cobalt, and 15 ozs. of silver to the ton. In this case the antimony (or arsenic) essential to the speiss was being lost to India and Burma. Amongst the many uses of nickel, mention may be made of nickel-steels (including stainless steels), other nickel-alloys, nickel-plating, and the use for coinage in India in the one-, two-, and four-anna pieces, which contain 25 per cent of nickel with the balance copper.

Salt.—The Burmese production of common salt averages some 40,000 tons annually, and in addition a considerably larger quantity is imported. The major use is, of course, for domestic purposes: the statistical position shows that, should it be decided to establish in Burma chemical industries using salt as a raw material, it would be necessary further to develop domestic sources of supply, or import correspondingly larger supplies. The major part of the Burmese supply is made from sea-water throughout the coastal districts. But a small portion is obtained in Upper Burma from brine wells and saline soil.

Antimonial Lead.—This is another by-product of the Namtu smelters, containing, in 1938, 82 per cent of lead, 18 per cent of antimony, and three ozs. of silver to the ton. It also was exported for further treatment. In addition there has been a small output of antimony-ore from 1935 to 1938, ranging from 34 to 199 tons annually, derived at least in part from the Amherst and Thaton districts. The figures are, however, too defective for inclusion in the tables. Antimony is used principally in the manufacture of alloys required to expand on cooling and give sharp castings, such as for type-metal.

Gold.—The value of the small production is about £7,000 annually, and to this extent it improves the credit of Burma.

Iron-ore.—The Burmese iron-ore is won in the Northern Shan States for use as a flux in the smelters at Namtu.

Bismuth.—A small output of native bismuth is reported from Tavoy during the years 1935 to 1937. This metal is used for the manufacture of easily fusible alloys and for medicinal purposes.

Molybdenite.—Molybdenum is one of the rarer metals required for the preparation of certain special steels used—for example, in automobiles, for rifle barrels and high-speed tools, as also in chromium-molybdenum-steels in aircraft construction. There are also many chemical applications. The sulphide, molybdenite, is found in Tavoy in association with the tin and wolfram veins, but no serious attempt appears yet to have been made to recover this mineral by scientific methods. During the last war there was a trivial output varying from 4 to 27 cwts. a year, valued at from

£15 to £25 a hundredweight. None has been recovered during the quinquennium preceding the present war.* But war needs and enhanced activity in the tin and wolfram industry may again lead to the recovery of small quantities of this rare but important mineral. The chief producing country is the United States.

Platinum.—Apart from jewellery and dentistry, platinum has many uses in the chemical and electrical industries. During the last war Burma was a trivial producer, but, as already explained, this source of supply has ceased.

Rubies.—Burma has long been a producer of rubies, sapphires, and spinels, being famous as the world's premier source of rubies. In ordinary circumstances all these gemstones must be regarded as articles of luxury and not in any way as war minerals, except in so far as they might serve as possible sources of foreign exchange. With the advent of war, however, there has been a greatly increased demand throughout the Empire for industrial precious stones, particularly rubies, which are essential for chronometers, the finest electrical instruments, and precision work generally. Burma is now arranging to meet all demands. This will give a fillip to the gemstone industry, which has been at a low ebb as compared with the past since the cessation of work by the Burma Ruby Mines in 1931. To understand this demand it should be recalled that both rubies and sapphires are forms of corundum, well known as an abrasive on account of its hardness; also the Continental sources of supply of synthetic stones are no longer open to us.

Summary

In summary it may be said that Burma's most important war minerals are outstandingly wolfram, and then petroleum (for aviation spirit), lead, tin-ore, zinc-ore concentrates, copper-matte, nickel-speiss, and antimonial lead; and that with all these Burma can make a substantial contribution outside Burma. In so far as certain of these products were formerly exported to Germany for further treatment they form a reserve for diversion to smelters and refineries within the Empire. The output of wolfram and of the metallic products of the Burma Corporation can doubtless be expanded, and there is also probably scope for a moderate expansion in the Burmese output of aviation spirit, provided an outlet can be found for the associated by-products.

A comparison of this list of special Burmese products with those selected for special mention in the summary of the Indian article will show that the two lists are complementary except for copper, each country filling deficiencies in the other's list. The two countries together can make a splendid mineral contribution to the joint efforts of Empire countries situated round the Indian Ocean, being organized as a result of the recent Eastern Empire Conference at Delhi.

One deficiency neither country supplies—namely, sulphides, or sulphur, for use in India or Burma for the manufacture of the sulphuric acid so essential as a basis to chemical industry and the manufacture of explosives. The only smelters in these two countries treating sulphide ores are those of the Indian Copper Corporation in India and of the Burma Corporation in Burma. The recovery of sulphur from the fumes at these two places would yield a substantial amount of acid, as would the treatment in the East, with recovery of sulphur, of the zinc-ore concentrates and copper-matte at present exported. At present sulphuric acid in both India and Burma is made from imported sulphur, derived from Sicily, with some contributions from Japan and Germany. The average imports of sulphur into India (including Burma in 1934 to 1936) in the quinquennium prior to the present war amounted to some 25,000 tons annually. These facts should provide a revived incentive to a project mooted during the last war of smelting the Burmese zinc concentrates in India.

*The Imperial Institute records 14 cwts. as produced in 1937, but this does not appear in the Indian Records.

Briton Is Held

Caught in the Japanese advance on Foochow while returning from an inspection tour, Mr. Charles Gordon Pearson, foreign district superintendent of the Salt Administration at Foochow, is reported to have been detained by the Japanese.

The Japanese have set up a new government of 21 members, with Mr. Ling Chee-ming as chairman and Mr. Lee Meng-bing, vice-chairman.

The Burma Road and Industrial Development in China

By Dr. C. A. MIDDLETON SMITH, M.Sc., M.I.MECH.E., LL.D.

(The Engineer)

No triumph of the civil engineer has attracted such world-wide attention as the new road that connects the Burma and China frontier with the large inland provinces of Yunnan and Szechuen in Western China. The interest of millions of newspaper readers has been aroused because of the effect of the road upon the China-Japan War and with our own struggle for survival. "To-day the fortunes of Western civilization have become inseparable from the eternal Chinese." Those words were written recently by a renowned English journalist; it is well to remember them.

Newspapers have recently explained that the Burma Road is an astounding affair, running over high mountains, down precipitous cuttings, crossing famous gorges over dizzy bridges, and that it was built in an incredibly short time by hand labor of a patient and industrious people, with no other mechanism than a stone boulder hauled by a bullock!

They have not mentioned that there were also Chinese engineers at work on the road, engineers who had had a sound technical training in well-equipped universities. They used modern materials, such as steel and concrete, for the many bridges, culverts, etc. There was no more mechanism than was in use centuries ago, when the Chinese built the Great Wall and the Grand Canal. Yet it was their knowledge of applied science, as well as the efficient manual labor of the workers, that made it possible for the Chinese to build the road over this difficult country.

Some time ago the writer described* in detail, the engineering problems solved by the Chinese who built the road. It is now proposed to discuss "the imponderable forces" that are at work in Asia and that are rapidly changing the industrial and social systems of a large number of people in that continent. Since the spread of a knowledge of applied science has been the chief cause of these changes it may be of interest to engineers to consider them and their probable developments.

The building of the Burma Road has demonstrated what can be done by an almost unlimited supply of Chinese man power. In Malaya, Hongkong, in China, and in other parts of the world, Chinese and British have worked together to their mutual advantage. The Chinese have supplied the man power needed for engineering and industrial schemes and the British the technical knowledge and administrative experience. It is not improbable that the present conflict will result in closer co-operation between the two nations.

Although it is my conviction that British engineers will, when peace returns, take an active part in the inevitable transformation of large areas in Asia, yet an increasing number of native engineers will be employed. The greater the number of these native engineers at work in their own countries, the more rapid will be the development of natural resources and the greater the demand for imported machinery. Foreign advice for large engineering schemes will be needed. There are now a considerable number of Chinese and Indian engineers who have a sound knowledge of applied science. My experience with Chinese engineers makes me believe that they have the patience, industry, and ability that is a sure foundation for successful work.

Moreover, the Chinese artisan is a great aid to any engineer. No more industrious and good tempered workman can be found. More than one engineer-captain, in charge of a large number of Chinese artisans in the important R.N. Dockyard in Hongkong has expressed to me his great appreciation, and indeed admiration, for the Chinese, who so quickly learned how to use new types of machinery. Many thousands of them are in the big private dockyards in the colony, where they are building and repairing ocean-going ships of big tonnage. Many other Chinese artisans are at work in Malaya, Siam, and other parts of the Far East.

Mining and Mechanization

The Japanese invasion of China has stimulated mechanization and mining developments to an extent that seemed impossible three years ago. The Chinese intellectuals always held the Japanese in contempt, but the terrible behavior of the Japanese soldiers in China has created an intense hatred amongst all classes, and it will live for many years. Like the people in Britain, the Chinese "can take it," and their engineers and artisans will work on until the enemy is defeated. Their tenacity of purpose has enabled China to make a steady advance in developing her internal resources; that is much more important than a spectacular military victory.

Before the Burma Road was built the two largest provinces in China, Yunnan and Szechuen, respectively 150,000 and 220,000 square miles in area, were isolated (England is 50,874 square miles in area). It is true that of late years the railway from the coast in Indo-China has connected Kunming (the capital of Yunnan province) with the sea—the railway that "cost a human life for every sleeper laid for miles along



The Burma Road.—Map shows the route from Rangoon to Kunming and position of newly acquired Japanese air bases in Indo-China; also are shown regions of the Indo-China border, which have lately been in dispute between Thailand and the French authorities

* Reprinted from *The Engineer in Far Eastern Review*, February, 1939.

the dreaded Nanti valley." There was also difficult water transport up to Chungking, in Szechuen. 1,350 miles above Shanghai. It was exciting to make a trip in a British vessel of about 1,200 tons register, driven by oil engines of 3,500 h.p., through the famous gorges, where the rapids make navigation perilous and where the difference between high and low water each year is about 180-ft. There are no British ships operating on the Yangtze to-day; most of them are laid up, and it is probable that the loss is about £250,000 per annum.

These two provinces are on a lofty plateau; Kunming is at a height of 6,400-ft. In Yunnan there are four arsenals, several power-driven factories—there are 18,000 spindles in operation—and immense mineral wealth—tin, coal, gold, etc. Kunming is 2,000 miles from the old center of government, now called Peiping; the Imperial express took 100 days for the journey. From Chungking to Rangoon is 1,500 miles. The journey now takes about eight days by road and rail; this will be improved upon.

Kunming is 600 miles from Chungking. The total length of the road to Laschao, the railhead in Burma, is 772 miles. The Burmese Government built the 124 miles of road in their territory, and at the other end the Chinese Government had completed the 281 miles of road from Kunming to Hsiakuan two years before the outbreak of war. Since the outbreak of war more than 5,700 kiloms. of highways have been built in the interior of China, and the Minister for Communications, Mr. Chang Kiang-an, recently stated that the vastness of the interior of China necessitates a huge fleet of trucks to carry on international trade.

From Hsiakuan to the frontier, 367 miles, the road was built over mountains, 8,000-ft. high. It passes over two mighty rivers (the Salwen and the Mekong) and countless valleys that make the country look like a toast rack. The gradients are appalling. There are hairpin bends where the road is only 8-ft. wide, with a drop of 2,000-ft. for any vehicle that slips over. A Chinese engineer told me, in a casual manner, "We lose on the average two lorries and three or four men every day on the road, but that is nothing in war." He reminded me that in Yunnan province alone, 10,000,000 lives were lost in the sixteen years of the Moslem rebellion (A.D. 1856-72). There were many more casualties during the Taiping rebellion in the middle of last century, but which did not affect Yunnan.

Of their present affliction, the Chinese say, "This, too, will pass." In a land where flood and famine have periodically taken a toll of millions of lives, and where rebellions have decimated the inhabitants of large districts, calamities are accepted with a stolidity that astounds the English. It is a characteristic due, to a great extent, to a social code which has been observed by the race through many generations, and which insists that the family is of more importance than the individual. Brave and cheerful, industrious and intelligent, but pledged to parentage, the Chinese in his home formerly asked nothing from the outside world, and felt no "national" obligations to that outside. That social system was not likely to throw up natural leaders for a nation, such as the *samurai* in Japan. That is why this intelligent and industrious race seem to be unable to organize any large undertakings. The war and the new methods of communication have, however, unified the nation as never before. It has always been an axiom in China that the people have not only the right, but the duty, to rebel against oppression, and often have they done so. Any Chinese Government must guarantee personal freedom, but to-day it is accepted that it cannot only guide but compel.

The Province of Szechuen

Their social system made the Chinese weak in organization, and so American experts were engaged to organize traffic on the Burma Road. They have effected great improvements. No doubt it is well camouflaged in the difficult country through which it runs. The Japanese will bomb it, but my inspection of craters in South China showed me they are poor marksmen. And the Chinese have huge labor battalions ready to make repairs.

Szechuen, now the home of the Chinese Government, is about twice the size of Britain and has a population at least equal to



Map of Western China

that of Japan. A tremendous influx of refugees from the Yangtze Valley has enormously increased the numbers. Many of the refugees are skilled artisans and engineers. A great amount of machinery was carried up into the province in advance of the Japanese tide up the Yangtze River. With abundance of cheap labor, it is being used, not only for military purposes, but to utilize the great variety of raw materials in the province. For Szechuen is rich in many things—foodstuffs, such as rice, wheat, maize, sugar, and oranges; minerals, such as iron, copper, salt, coal and gold; textile materials, such as silk, wool and hemp. A great quantity of wood oil was exported; much of it was carried in bulk in ships down the river to Shanghai. Some of the immense wealth of metal in Yunnan province—gold-bearing copper, the zinc of the Kungshan coalfield, and silver-bearing lead—was carried by coolies and animals, and later by motor trucks, to markets in Szechuen.

As long ago as 200 B.C., Chinese engineers provided a remarkable irrigation and flood-prevention scheme in Szechuen. It transformed the Chengtu Plain from waste into fertility, an area equal to that of Middlesex. Ten years ago the population on the plain was ten times as great as that of the English county, but the great influx of refugees has added to the numbers there.

Transport in South-east Asia

Last year it was my good fortune to travel some thousands of miles by motor through French Indo-China, Siam and Malaya. Visits were also made to Manila and Java. It was surprising to find such excellent motor roads in all these places, and to be told of the recent advances in modern methods of transport. Public vehicles were crowded.

The French engineers had done good work in Indo-China. One of them told me of a large reclamation scheme on the coast which had been recently completed. He stated that the land reclaimed had provided work, mostly on ricefields, for so many people that 3,000,000 human beings were living on an area which previously was entirely uninhabited.

French scientists had also been at work and had done a great deal to make the country a center of interest to Europeans and a more prosperous home for the natives. No engineer could visit the famous city of Angkor without feeling immense admiration for the constructive ability of the builders of the temples and palaces of ten centuries ago. For about 300 years a million people lived in the City of Angkor, and then it was suddenly deserted; no one lived within a hundred miles of it, and no one knows why it was deserted. Europeans had never heard of it until at the end of last century the French discovered it, buried in the jungle, which has reduced to ruins many of the huge stone buildings. But the French have restored the vast temple called Angkor Vat, certainly the most fascinating building it has been my lot to inspect. When, after a 300-mile motor ride from Saigon, over excellent roads, but under the heat and glare of a tropical sun, we reached Angkor, we met an acquaintance, a shrewd Scotch banker who had travelled all over the world. He had just returned from a visit to Angkor Vat. "Let me come with you to see it again," he said. "You are an engineer, so you ought to be able to explain to me how they erected a building higher than Notre Dame, built only of huge

stone blocks, and standing through nearly eleven centuries, without any mortar or cement to hold it together." Then, after a pause, he said: "Well, I have been disappointed when seeing many of the sights of the world, after reading about them in the tourist books, but, believe me, there is no baloney about Angkor—it beats any description!"

The building is now in a good state of restoration. It was probably saved from the encroachment of the jungle, which ruined so many other fine works, because it was surrounded by a moat. It is rectangular in shape, and on the ground floor is a wide corridor, with walls built up of large stone blocks placed one on top of the other. You can walk round the four sides of the rectangle, along this corridor, the total length of which is 2.2 miles! And you can climb up the many stone steps to the *sanctum sanctorum* on the third storey of the temple. "Tell me how they got that huge coping stone, that forms the roof, up here," said the banker. The answer was that an enormous earth ramp must have been provided for the purpose. The quarries whence came the large rectangular stones that, piled one on top of another, made up this amazing temple, were several miles away, and the stone must have been floated on rafts down the river. It is strange that few Europeans in the Far East have heard of Angkor, and on my return to England it was noticeable that none of my friends had heard of it. Indo-China is but a name to most people, but it meant much to the many French people there, amongst whom were engineers and scientists, pushing forward the new type of peaceful civilization into Asia. We cannot believe that their work has been in vain. The Japanese have obtained possession of the railway from Hanoi, on the coast, to the Chinese frontier. A few months ago they bombed the end of one of the tunnels, and a train, containing amongst the many passengers several Europeans, was wrecked and everyone on the train was killed. Chinese engineers, with as many coolies as they wanted, made a new tunnel and had the line running again within a month.

Water and Road Transport

Between the great mountain system in Asia and the seas to the south and east—the Indian and Pacific oceans—there is an immense granary, whose economic strength has not yet been fully developed, and that is awaiting the spread of knowledge concerning applied science in order to yield its tribute to mankind. And in that area 48 per cent of the world's total population is concentrated on barely five per cent of the land surface of the earth!

To the north and north-west of the high mountain ranges is the background of the vast Arctic-Atlantic hinterland, with its endless leagues of steppes flanked by a huge area of primeval forests. Centuries ago some 200,000 horsemen, intent on looting the rich plains to the south of China, found their path blocked by that marvellous structure, the Great Wall. The horsemen recoiled, like the waves of the sea stopped by a cliff, and they dashed across the many thousands of miles of Asia, right up to the walls of Vienna. Thus did the Chinese engineers who built the wall bring the Turks into Europe. The reaction came with the development of applied science, and especially since the invention of the steam engine, accelerated the rise of ocean power and enabled engineers to make travel by rail easy, rapid, and safe. Calais and Hongkong in South China were connected by rails that run through the tropics, Siberian forests, across Asia and Europe, connecting the Pacific Ocean with the English Channel. Many thousands of miles of railways and motor roads were built. The old single-file caravan tracks, with their tens of thousands of human and animal bearers, slowly carrying goods between trade centers, have been converted into modern highways. By air, passengers and mails have been carried from Hongkong to London, from Hongkong to Chungking and other remote cities in China, and from Hongkong across the Pacific to San Francisco.

In Asia Nature has developed certain features on a gignatic scale, but there is room for them. There are abrupt contrasts between the comparatively small swarms of raiders of great mobility in the north and the remarkable concentration of humanity, 48 per cent of the world's population, between the ramparts of the great mid-world mountain system and the Indo-Pacific Ocean. On the one side, virility; on the other, there seemed to be deceptive immobility, brooding over Hinduism and Buddhism, creeds of calm and contemplation.

India was the first part of Asia to be affected by the work of the engineer, and, whatever may be the political and social changes

in that land, there will always remain many monuments to commemorate the devotion of British engineers to a sense of duty.

Burma and Siam presented greater obstacles to engineers than India; obstacles of a political type rather than technical difficulties. But there has been progress. In recent years the Japanese have put forward a scheme which at first sight seems attractive, but which presents enormous engineering difficulties. It is to cut a canal across the Kra Isthmus in Siam. It would save 600 miles of sea travel between Calcutta and Canton, and at least 1,200 miles between Rangoon and Bangkok.

My tour in Malaya last year made me realize that the notable economic progress in that country had been very largely due to the work of engineers. Everywhere there was evidence of the determination of the Government to do everything possible, so that the country should benefit by improved methods of communications and engineering schemes of all types. It was typical of the enterprise of Government officials in Malaya that we travelled in air-conditioned railway carriages—a very great relief in a tropical country. Malaya supplies plenty of evidence, as do Hongkong and Shanghai, of co-operation between Chinese and British.

Chinese Engineers and Scientists

Mechanized transport, ships, motor-cars, trains, and aeroplanes enabled us to travel thousands of miles along the coast line, through cities, villages, rice fields, rubber plantations, and jungle in this fascinating part of the earth. In the evening we listened to the B.B.C. news relayed from the Hongkong wireless station, and we knew that they could hear it in many parts of China. We found that the English language could be understood in nearly all the places we visited. It seems inevitable that the vast experience that Anglo-Saxon engineers have gained in tropical lands (India, Africa and America) will be applied in this part of the world.

About thirty years ago a number of us listened to Dr. Diesel at a meeting of the Institution of Mechanical Engineers, when he outlined his belief that the British would utilize tropical soil for the production of vegetable oil suitable for the production of power. When we saw the rather crude mechanism installed on the palm oil plantations in Malaya, where they obtain quite large quantities of oil for human consumption, the vision of Dr. Diesel came to my mind, and it often returned as we rode in comfort through the jungle. Under the tropic sun Nature accelerates the reproduction of vegetable, insect, and animal life in a manner that at first bewilders the native of the temperate zone. It seems that the earth and the fulness thereof have been placed at the disposal of man, but that *homo sapiens* has, so far, miserably failed to make good use of the good earth and the sun.

The contrast between many of the natives of South-east Asia and the Chinese who had emigrated to the south made me realize that Nature abhors indolence even in a land where a man can exist on a few handfuls of rice and the fruits dropped from the trees. Starvation is easily defeated, but malaria, enteric, and other preventable diseases each year claim millions of victims. Indolence leads to decadence. Many of the natives, and some Europeans, live as if "there aint no Ten Commandments," and pay the inevitable penalty, for which the climate is too often blamed. The poverty-stricken Chinese emigrants, on the other hand, are the most active workers, pulling through hardships that would kill the average European, demonstrating that work will win and that the meek—and energetic—accumulate wealth. These Chinese ex-coolies are the millionaires and ideal citizens in Malaya, Siam and Indo-China. They were taught from infancy the Confucian code that man is capable of great development provided that he follows the moral code taught by his elders and betters.

An Englishwoman who travelled over the Burma Road in a lorry wrote: "I sat down to consider my revolutionized ideas of the Chinese. True, my knowledge of them was extremely slight, gleaned from hearsay, books, and casual acquaintance with members of the race in other parts of the world; but nothing I had learned had prepared me for their amazing kindness, their attention to practical detail, their strong sense of humor." My own experience makes me re-echo those words.

The wealthy Chinese emigrants remain loyal to the Confucian code. They train their sons to respect their elders, their teachers, and to remember the old axiom that of all men the scholar stands highest in social status. They accept another ancient axiom from

their classics, viz., that people should be governed by moral and intellectual agencies rather than by physical force.

There are many young Chinese men and women who are seeking the new knowledge in European and American universities, but they know the Confucian code. You see the results in the struggle made by the Chinese graduates to build roads and communications of all types. They have installed power plants and opened up mines. They are at work on the new hospitals—my friend, Dr. Ling, was running a hospital on the Burma Road when last we heard of him. They are teaching the laws of hygiene: they are trying to improve agriculture, and to urge the importance of scientific research. Perhaps some are attracted by certain Western political and economic theories, much of which will not fit into the Chinese social system. But make no mistake, there is the same dynamic urge to do useful work that brought wealth to their fathers in a land waiting for development.

Mention must be made of the Malay islands—Java, larger than England; Sumatra and Borneo, much larger; Celebes, and numerous other islands—these are the lands for which the English and Dutch fought each other so bitterly in the seventeenth century, and where it seems probable they will closely co-operate for the development of their natural resources at no distant date. What opportunities for the engineer and scientist are offered by these fertile areas: Already the ubiquitous Chinese have done much of the commercial development. Some of our Hongkong engineering graduates returned to Java, Sumatra, or Borneo, and we heard of them installing power plants for sawmills, cold storage, etc., or engaged in surveys of the jungle. There are schools in this area where the Chinese are trained in English up to matriculation standard.

It can be claimed that the British were the pioneers of engineering works in China, and, indeed, in the Indo-Pacific areas. Not only did they build railways, docks, and industrial power-driven factories, but they were responsible for great improvements in harbors and inland waterways. For many years there was blind opposition to Western science in China, but that no longer exists. On the contrary, there is a demand for any machinery or other equipment that will aid the war effort or develop the resources of the country. Recently an officer of the Hongkong University flew to consult the Chinese Government in Chungking, as to how the University could best help China. A reliable correspondent in Hongkong has informed me that the reply was: "Send us as many trained engineers as you can; hundreds of them." They were not interested in anything else! My experience in Hongkong was that the Chinese did not oppose the instruction in science of their own nationals, but that a number of English residents, particularly graduates of Oxford or Cambridge, who had studied classics, did their utmost to prevent any extension of the engineering departments. They did not hesitate to inform me that engineering was not a fit subject to be included in a university course. There should be, they said, a technical school unconnected with any institution that confers degrees. During my service in the universities of Birmingham and London in the early part of this century, my colleagues in the Faculty of Arts often expressed those views—in a very pleasant manner—but which left the impression that they believed that engineers were out of place in the academic cloisters, which, they said, should be preserved for those concerned with ideas which do not affect things material. It was useless to talk to them about the ideals of engineers; all of the evils of the industrial system were attributed to the inventors of machinery. That spirit still exists in England. Only a few days ago an Oxford professor solemnly stated in my hearing, in the course of an address, that the war was caused by wireless, because Hitler would never have attained to such power without the aid of that invention! There are perhaps men of the Mandarin type of mind in Britain, as well as a few in China. It is significant, however, that the Chinese Government, in this crisis, is doing everything possible to encourage engineering developments.

It is not only the Burma Road that is of interest to those British engineers whose thoughts are turned to the Far East. We see in the conference at Delhi evidence of co-operation between India and the rich tropical countries in the Pacific. We can be sanguine that at no distant date there will also be co-operation with the Chinese. In the last war the Chinese labor battalions in France did splendid work. It is not improbable that in this war we may seek the aid of Chinese labor and co-operate much more closely with the Chinese Government. It is my firm conviction that the Chinese work more harmoniously with British people than

with any other nationals. It has been stated that there are 3,000,000 Chinese who have British nationality and who reside in Malaya, Hongkong, and other parts of the British Empire. In the days of reconstruction it will be to the mutual advantage of both nations if they can co-operate in the economic development of South-east Asia.

The Powder Keg and the Spark

(Continued from page 120)

Nazi-ism, is active. It has overrun most of Europe, and now it threatens to seize Africa and the Near East. The other, Communism, bides its time in a state of comparative dormancy, ready to go into action when the time is ripe. Perhaps these rival foes of capitalism will turn on each other, but it is only wishful thinking to believe they will destroy each other and leave the world free of both influences.

Soviet Russia as the exponent of Communism stands alone to-day in an extremely advantageous position, and nations unalterably opposed to her ideology seek her friendship as a matter of convenience. They do it knowing that some day there must be a reckoning between their way of life and the crusading force of Communism that will not rest until its doctrine is spread throughout the world.

At the same time Nazi-ism is building with swift momentum an edifice of expansion whose very inertia will not permit Nazi leaders to halt at any arbitrary point. The system must continue to spread or die, like the man leaping desperately from ice floe to ice floe, never able to rest on one because it will not sustain his weight. Meanwhile the partners of the Axis have learned that as their usefulness to the Nazi cause diminishes is ended their portion of the spoils becomes correspondingly smaller and Germany's larger. There is no equality for other nations in the Aryan Nazi world, just as there is no place for any other political-economic system in the Communist plan of world revolution.

In the final analysis Japan has nothing in common with these two revolutionary forces. Her primary interests are those of the Anglo-American bloc regardless of her position to-day as an Axis member, despite the sword-rattling of hot-heads, and in spite of conflicting view points over the China issue. Her ambitions, in contrast, are limited and her needs are in terms of survival, not of world domination. With Germany hammering toward Suez, it is not inconceivable that in the not distant future the Nazi forces supported by Fifth Columns and all the appendages of total warfare will be in India and at the very doors of Japan's sphere of influence. It is not impossible that outside of all considerations of material gain, Japan may be forced to drive south in her own defense in order to form a buffer against an advancing Nazi influence across the southern skirt of Asia.

Japan was a tremendously valuable ally for Britain and the United States in the last World War. While she figured in no major military aspects, her friendly presence in the Far East removed half of a hemisphere from the areas of possible conflict. A position of benevolent neutrality for her to-day would change the entire aspect of Anglo-American strategy against Germany. In a cold analysis of the advantages and disadvantages, in weighing the possibilities of future developments, there can be no doubt that an honorable compromise in China (yes, there are such things), made possible by U.S. mediation, would bear untold dividends in the long run in preserving the present world system and making the world safe for democracy.

In short, Japan is with the Axis to-day of necessity and not of convenience. A long-overdue compromise in which there is no question of betrayal or appeasement, will remove that necessity for Japan. This in turn will make it no longer necessary for Japan to continue irritating Britain and the United States, which will be the equivalent of another fleet for America and the safety and isolation of a great world area east of India, west of the International Date-line and south of Shanghai as a possible combat zone for the British.

The British have learned that one doesn't shoot at a half-buried time bomb to prevent it from exploding. They removed the bomb, but first, if they can, they probe into the mechanism of the bomb and render it harmless. It's tricky work, but it's effective.

Harbors and Ports of the Circar and Coromandel Coasts of South India

A Survey of Coastal Developments

By J. M. LACEY, M. INST. C.E.*

(The Dock and Harbor Authority)

THE general features of the Coromandel Coast, which extends from Point Calimere to the mouth of the Kistna River (diagram No. 1) are those of a gently undulating plain, sloping gradually from the Eastern Ghats to the sea. The strong monsoons, and the violent currents which sweep along the coast have thrown up ridges of sand along the coast rising in places to a considerable height. The small extent and the shortness of the deltas of the large rivers, discharging on this length of coast into the Bay of Bengal, when considered with regard to the length and the drainage area of their basins, and the general even width of the alluvial belt along the coast, seem to point to the existence in former times of alluvial land considerably eastward of the present coast line.

On the Circar Coast north of the mouth of the Kistna River, the coast line tends in a North-easterly direction. The deltas of the Godavari and the Kistna Rivers are slowly extending seawards, their progress being checked by the powerful currents along the coast. The coast line abreast these two deltas is shallow. North of the Godavari delta, along the shore, lie a series of salt and sandy swamps, but the coast line itself is broken by a number of bold headlands and beacons, which act as groynes to protect the land against encroachment of the sea.

Rain Fall

The seasons may be divided into—

- (1) The Dry period—Cold weather season January, February and March. Hot weather season April and May.
- (2) Wet period—South-west monsoon, June to September; North-east monsoon, October to December.

The South-west monsoon current sets in the Bay of Bengal during the first fortnight in June, and passing the Coromandel Coast to which it furnishes an occasional shower, crosses the coast line North of the Kistna River, above which the rain fall is heavier. In September the force of the monsoon begins to decline, and after the middle of the month it ceases to carry rain to the greater part of North India. The monsoon begins to recurve in October, and a copious rain fall is discharged on the Coromandel Coast, and on the plains of the Carnatic. The rains last till December, moving southwards with the declining year.

Cyclones in the Bay of Bengal are usually generated

during the changes in the monsoons. During the South-west monsoon they are rare except at the head of the Bay of Bengal. Occasionally cyclones develop in May. In October as the South-west monsoon gives way to the North-east monsoon, cyclones of very great intensity form in the Bay of Bengal and are propagated West or North-westward, sometimes curving to the North-west. The most destructive storms which visit the Circar and the Coromandel Coast are generally formed to the South of the Andaman Islands (Fig. 1) and cross the Bay of Bengal in a North-westerly direction.

The vast tidal wave from the Southern Ocean is propagated up the Bay of Bengal to the mouth of the Ganges River. Owing to the configuration of the Bay, and the depth of the sea bottom, the range of tide increases with the latitude. At Negapatam the usual range at springs is 3-ft. At Madras the maximum range of tide in a year is nearly 5-ft. The usual range at springs is 3-ft. 5-in. At Vizagapatam the range of tide is 5-ft. 9-in. The tidal range at ordinary springs varies from 9½-ft. to 11-ft. at different places in front of the mouths of the Ganges River.

The tides in the Bay of Bengal are largely affected by diurnal inequality of both time and height. The datum of the charts of the Bay where the diurnal inequality is considerable is the level of "Indian Spring Low Water."

The Coast of South-east India from Gangam to Point Calimere is lined with a sandy beach, and owing to the sudden shelving shore there is always a surf along the coast. The surf rolling in upon the coast during both monsoons renders it hazardous and imprudent to land at any time in a ship's boat. Along the whole stretch of this coast, the country or "Masula" surf boat is peculiarly constructed to pass the surf: being built without timbers, with its planks sewed together, it bends to the force of the surf, and is easily repaired. When it blows fresh with a strong current, the surf is dangerous even to these boats.

Movement of Sand Along the Coast

An enormous quantity of sand is moved along the coast, the direction of movement corresponding to the general direction and force of the waves. The movement is greatest near the shore and diminishes as the depth increases. The sand is arrested by any projection from the shore, the further side deprived of its protecting

*Formerly of the Indian Public Works Department and sometime member of Madras Port Trust.

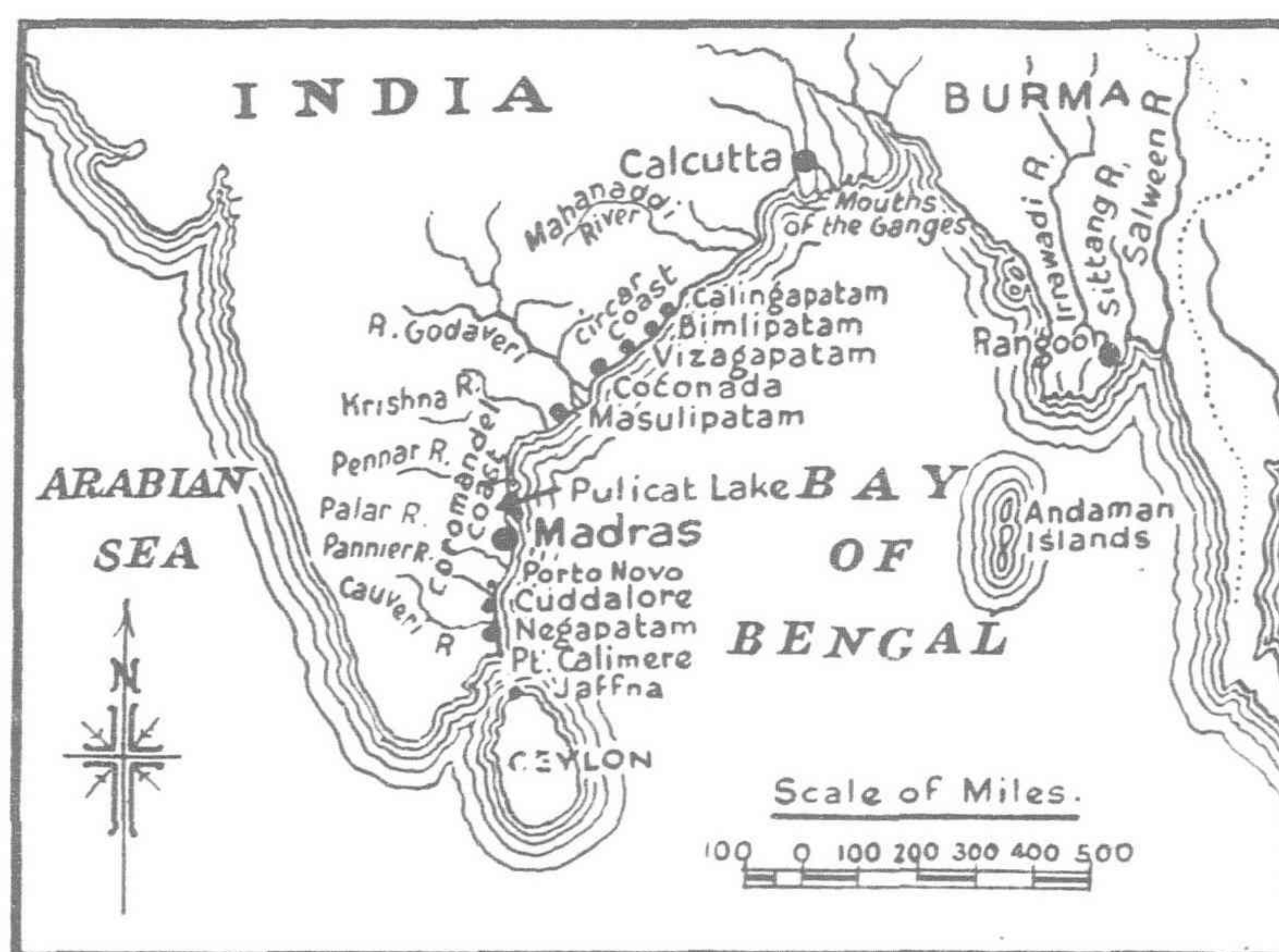


Fig. 1.—Indian coast ports

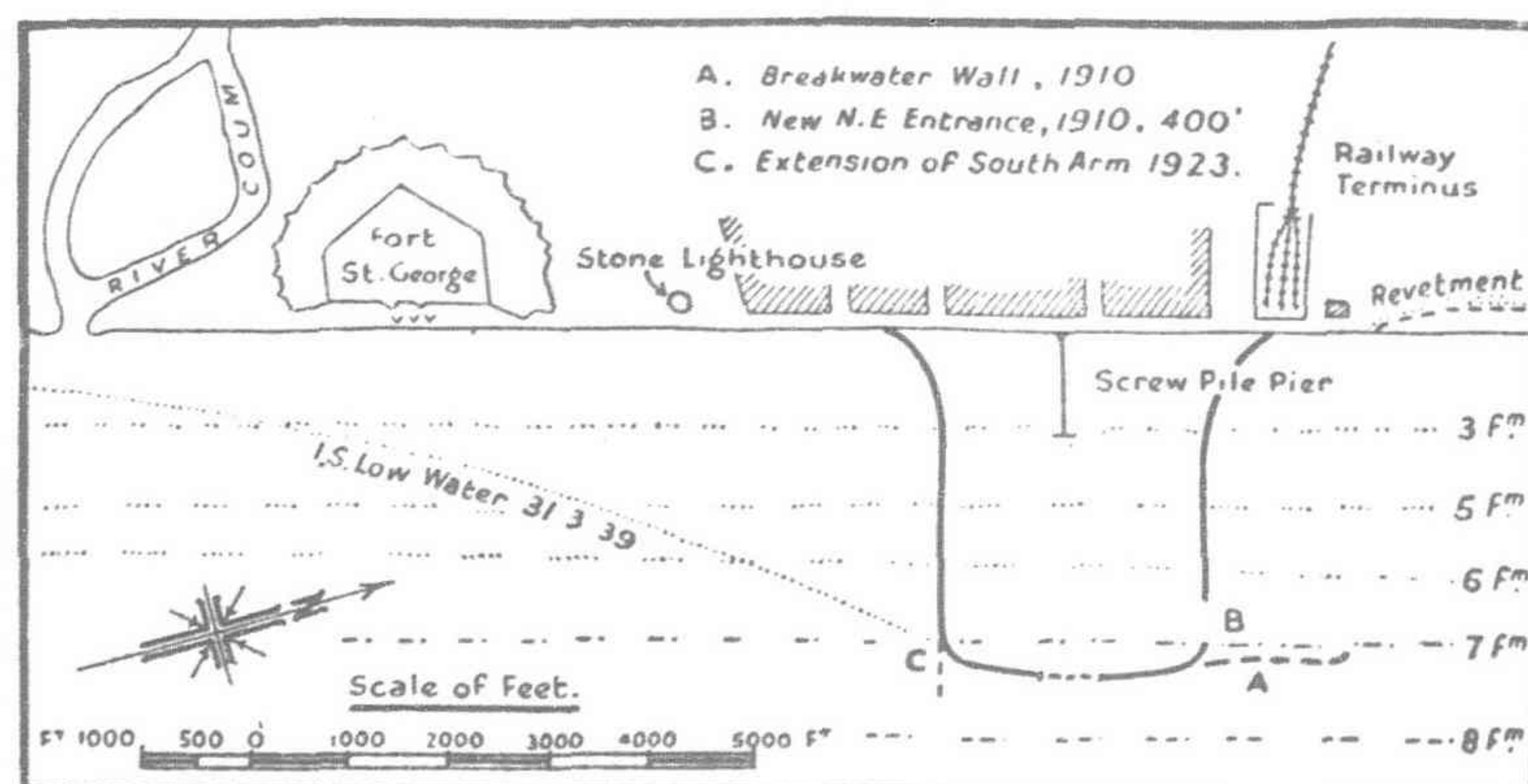


Fig. 2.—Madras roadstead in 1873

margin of travelling sand is eroded. Observations at Madras show the coast line to advance during the South-west monsoon. There is a tendency for the North-east monsoon to tear down the beaches and to deposit the sand slightly south-east of its former position, and within 800-ft. of the beach.

The administration of the major ports of Madras and Vizagapatam were taken over by the Government of India in 1937 and 1930 respectively. The minor ports are administered by the Provincial Government of Madras.

West of Point Calimere (Fig. 1) the coast consists of mud flats covered with mangrove bushes, and is flooded during high spring water. Depths of less than 3 fathoms extend from three to four miles off coast, getting deeper towards Point Calimere. The trade and importance of Point Calimere has been receiving consideration the last few years, and representations are being made urging that Point Calimere and Jaffna in Ceylon be the main Indo-Ceylon route instead of the Rameswaram Island route.

Ports north of Point Calimere along the Coromandel Coast, ships can come as close as $\frac{3}{4}$ to $1\frac{1}{2}$ miles from the coast. In the open roadstead no vessel, large or small, anchors closer than this distance on account of the heavy ground swell which tends to drive the vessel on to the beach.

The more important ports on the East Coast of South India are:—

Negapatam

An open roadstead with a depth of five to $5\frac{1}{2}$ fathoms, soft ground $1\frac{1}{2}$ to two miles from the shore, at the mouth of a small tidal river, which enables lighters to pass into a small harbor, and discharge on to jetties. Anchorage over sand and mud, depth shoals gradually towards the shore. In heavy weather a short broken sea sets up and it is inadvisable to anchor in depths of less than five fathoms. The chief exports are ground nuts to Europe and piece goods to the Straits Settlements. In the fiscal year 1937-38, 58,807 passengers sailed chiefly to the Straits Settlement and 29,519 arrived.

Imports valued at rupees	6,001,994
Exports valued at rupees	12,391,071

A rupee is valued at 1s. 6d.

Negapatam is the most important minor port on the Coromandel Coast south of Madras. In days gone by, long before the advent of railways and steamers, the trade along the coast of India was carried out in native sailing craft called *Dhoneys*, from 50 to 300 tons burden. These boats were manned by the descendants of Arab traders who had settled at the coast ports, and had inter-married with the native residents. There exists even to-day a colony of these mariners at Negapatam, who still carry cargo along the coast in their dhoney; the bolder ones venturing to the Gulf of Martabam, and to the Straits Settlements.

Cuddalore is an open roadstead. Vessels usually anchor in six to seven fathoms. In former days iron from Porto Novo used to be shipped to this country. Ground nut to Europe is now the largest export. In the fiscal year 1937-38—

Imports valued at rupees	4,375,176
Exports valued at rupees	15,406,880

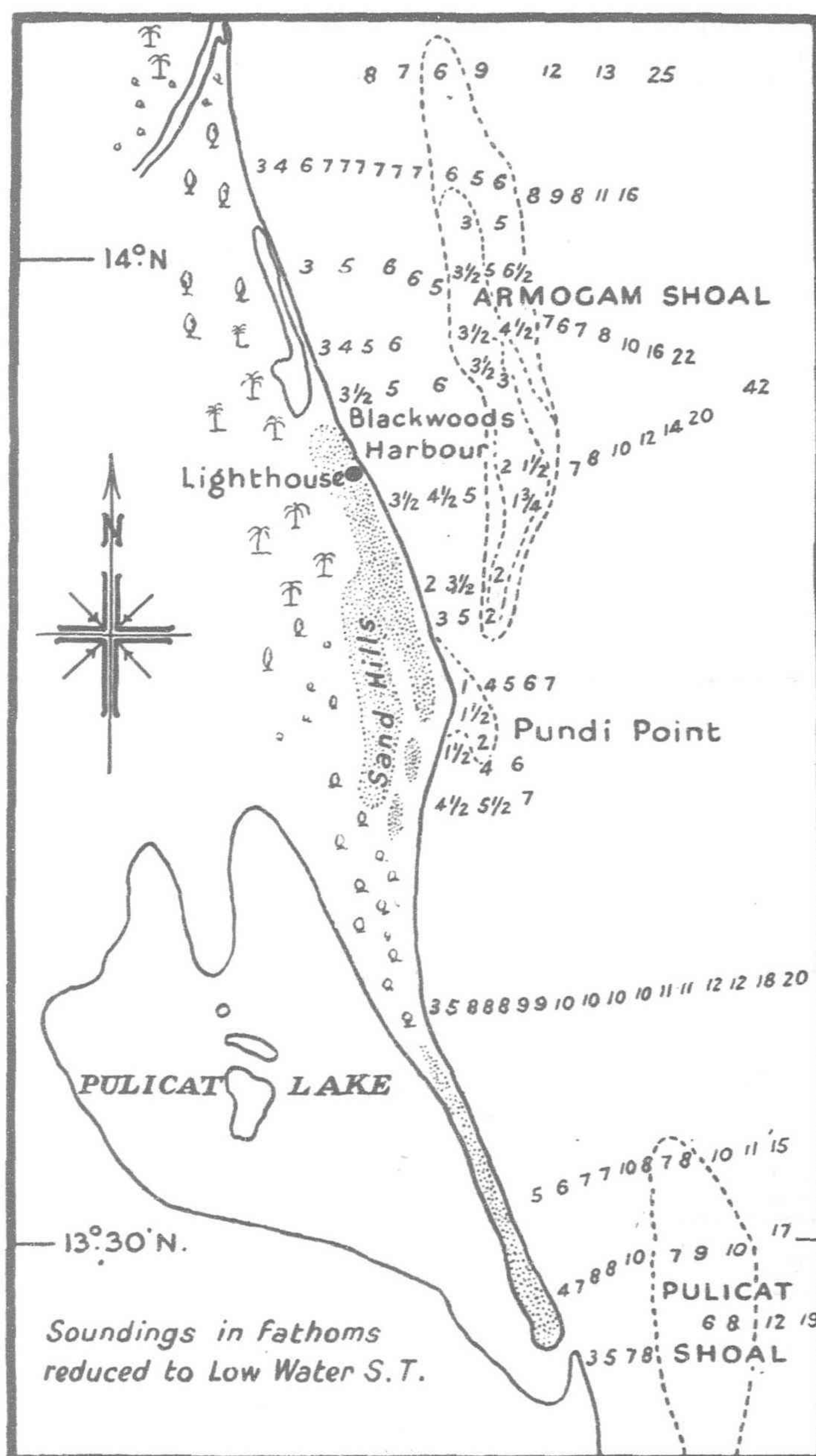


Fig. 3.—Chart of Armogam and Pulicat Shoals, 1848

Madras Lat. $13^{\circ} 06' N.$
Long. $80^{\circ} 18' E.$

In 1639 the East India Company first settled at Madras, previous to that they had a factory at Armogam. At Madras they obtained a strip of land six miles long, and one mile wide on which they built a factory, and surrounded it with a wall. The first fort was built in 1644.

Before the construction of the present harbor vessels used to anchor in the roadstead in seven to nine fathoms. The nine fathom line was about $1\frac{1}{2}$ miles from the shore. A prevalent ground swell exists tending to cast vessels ashore in spite of precautions. The scope for cables in moderate weather used to be 60 fathoms, and 80 fathoms in rough weather with a swell—bottom stiff clay causing a difficulty to extract anchors. Cargo and passengers were carried from ship to shore in Masula boats, carrying $1\frac{1}{2}$ ton dead load. In 1858 a screw pile pier 1,100-ft. long and 42-ft. broad with a T head 160-ft. long running North and South was constructed, having a depth of three fathoms at low water at its head, in order that boats might evade the surf (Dismantled in 1917. See Proceedings of the Institution of Civil Engineers, vol. ccvi).

The difficulty of the passage of the surf; the delay in shipping and transshipping goods, owing to the small size of the Masula boats; the loss by upsets, and pilfering, led merchants of Madras to make repeated petitions to Government to construct a harbor at Madras. The first proposal was for a breakwater, the committee appointed to consider the proposal in their report of January,

1869, favored a breakwater as opposed to an enclosed harbor, as for an equal sum of money, it would give more deep water shelter than a harbor. It would create a length of sufficient smooth water at the coast line to enable boats to land and come to jetties. Also vessels can enter and quit more easily from behind a breakwater than through one entrance of a harbor. In 1873 Mr. Parks submitted his proposals for an enclosed harbor.

Mr. G. Robertson, Harbor Engineer to the Government of India, in reporting on the schemes, stated that the breakwater by stilling the surf would remove one of the agents which move the sand, and that shoaling was likely to occur in both the proposals for a breakwater, and that of an enclosed harbor, but he considered the breakwater preferable. He stated that if such a breakwater were constructed, it should be placed in seven fathoms of water, preferably further out, and be at least 2,000 yards long. Sir Arthur Cotton, who was consulted, considered that the long shore movement of sand was not sufficient to interfere with the success of the enclosed harbor, but from nautical reasons he preferred a breakwater. Col. Orr, R.E., Chief Engineer to the Government of Madras, pointed out that it was evident to all who had studied the circumstances of the Madras beach, that any obstruction opposed to the current must have the effect of arresting the passage of sand which is in constant movement by the combined action of the surf and those currents, and of causing it to accumulate to the windward of the obstacles, and ultimately he, Col. Orr, had no doubt the coast line would be carried to the outer end of the walls of the harbor, and close the entrance. Mr. Parks in reply based on figures given by

Col. Rawlins, in 1857, on the quantity of sand which accumulated in front of groynes, calculated that for the triangle of sand between the coast, and a pier extending 1,200 yards from the shore to be filled, would be 160 years.

The proposal for a breakwater was eventually abandoned, and the first stone of the Madras Harbor was laid by the Prince of Wales (the late King Edward VII.) on December 14, 1875. The harbor was practically completed in 1881, when in November of the same year the arms were destroyed by a cyclone, which crossed the coast 80 miles south of Madras (See Proceeding of the Institution of Civil Engineers, vol. clvi., pp. 244-245).

The arms were rebuilt to a stronger section, the height of the whole work was raised 6-ft., and a barrier of 30-ton wave-breaking blocks was deposited at random on the sea face of the arms.

The result of the construction of the harbor was a vast accumulation of sand South of the harbor, while North of the harbor a considerable extent of land and buildings were eroded and washed away; further erosion being prevented by heavy stone revetment.

The Eastern opening gave a rough uncomfortable harbor, and the sand, which, since the commencement of the work had been accumulating South of the harbor, began to flow across the opening, which was silting up at the rate of one foot a year. In 1910, the Eastern entrance was closed, and a North-east entrance was opened, guarded with a protective breakwater wall. The history of the Madras Harbor up to the year 1920 is contained in the following "Proceedings of the Institution of Civil Engineers," viz.—

- (1) Remodelling and equipment of the Madras Harbor, vol. cxc.
- (2) Coastal travel of sand near Madras Harbor, vol. xciv.
- (3) West Quay, Madras Harbor, vol. ccvi.
- (4) Restoration of damage, breakwater end, Madras Harbor, vol. ccx.

In 1923, the extension of the South arm of the harbor eastwards, called the "New Breakwater," or "sand screen" was commenced. The work was designed to prevent sand creeping along the sea, or East face of the harbor. The work was completed and protected by 30-ton wave breaker blocks, in 1926. Fig. 2 shows the Madras Roadstead in 1873. The harbor was built according to Mr. Parks' design, and the subsequent alterations described above are shown in broken lines.

The "sand screen" was effectual in checking the creep of sand along the East face of the harbor. No movement of sand had taken place which could adversely affect the entrance. Vessels up to 700-ft. in length and 31-ft. draught were able to enter the harbor at all states of the tide. The harbor is able to accommodate 13 and 14 vessels of deep draught, besides smaller ones. For most days of the year steamers can berth alongside quays and discharge passengers and cargo with expedition, and at a comparatively small cost. In the last few years the sand problem at the "sand screen" is becoming acute. The contours North of it are advancing Eastwards of their position in 1925 and causing some anxiety to the Harbor Authorities.

The number of vessels that entered the port in the fiscal year 1938-29 was 730. The largest vessel had 15,105 gross tonnage. The deepest draught vessel leaving the port was the ss. *Lachlan* 29-ft. forward and 29-ft. aft.

VALUE OF TRADE, 1938-1939:

Imports, Private Rupees*	163,162,525	State Rupees	1,379,111
Exports, " "	133,113,363	" "	411,273

*A rupee is equivalent to 1s. 6d.

CHIEF IMPORTS AND EXPORTS

Imports, 1938-39	Tons	Exports, 1938-39	Tons
Cement	10,843	Punker Coal	8,705
Teak Timber (Burmah) ..	19,590	Liquid Fuel	23,043
Raw Cotton	3,925	Ores	19,257
Textiles	4,685	Ground Nuts	183,176
Dyeing and Tanning ..	13,961	Tanned Hides and Skins	25,338
Mineral Oils	168,256	Oil Cakes	29,951
Sugar	3,782	Tobacco (unmanufactured)	20,040
Coal	95,011	Onions	25,163
Metals	22,804	Scrap Iron	5,792

Armogam Shoal and Blackwoods Harbor

Turning to Mr. Robertson's report on the proposed breakwater at Madras, he pointed out that any tendency to travel in the loose bed of sand, must be due to whatever velocity the littoral currents have combined with the oblique action of the surf. . . . These are the two great agents at work moving the sand. If the velocity of the littoral current is not sufficient of itself to carry the sand along the coast, then the withdrawal of the surf, the other agent, would cause the sand to be deposited at any place where the littoral currents alone are at work. In short, if there is such an immense quantity of sand in motion along the shore at Madras, then even a breakwater would not succeed. It would still the surf and remove one of the two agents which move the sand. If Mr. Robertson had inspected the Armogam Shoal and "Blackwoods Harbor," he might have modified his views regarding the effect of the proposed breakwater on the Madras Coast.

The chart Madras to Ramipalem (Fig. 3) shows the Pulicat Lake, a shallow backwater; the Armogam Shoal joins the shoal that fronts Pundi Point, and extends more or less parallel with the coast for about 14 miles northward. The depths on the shoal are generally $3\frac{1}{2}$ to $1\frac{3}{4}$ fathoms. It has a least depth of $1\frac{3}{4}$ fathoms, three miles nor'-nor'-east of Pundi Point, over which the sea sometimes

breaks. Between the inner edge of the shoal and the coast there is a space three to four miles wide, of still water called Blackwoods Harbor, after Admiral Sir Henry Blackwood, who had it charted, and suggested that it would make a practical harbor: with soundings from $4\frac{1}{2}$ fathoms near shore to six to seven fathoms near the shoal, where ships may anchor by passing round the North end of the shoal, bottom sand with good holding ground. There is also a channel four to six fathoms depth and half mile wide between Pundi Point and the Shoal which leads to "Blackwoods Harbor."

There is a lighthouse at the village of Armogam now called Monapalem, Lat. $13^{\circ} 53' N.$, Long. $80^{\circ} 8' E.$, visible 14 miles, which warns vessels of this shoal. Armogam was where the first factory of the East India Company was established. The remains of the fort built by the Company are near by. The charts of 1848 and 1918 show little change in the shoal and harbor. The Armogam Shoal indicates the nature of design for any shallow breakwater on the coast.

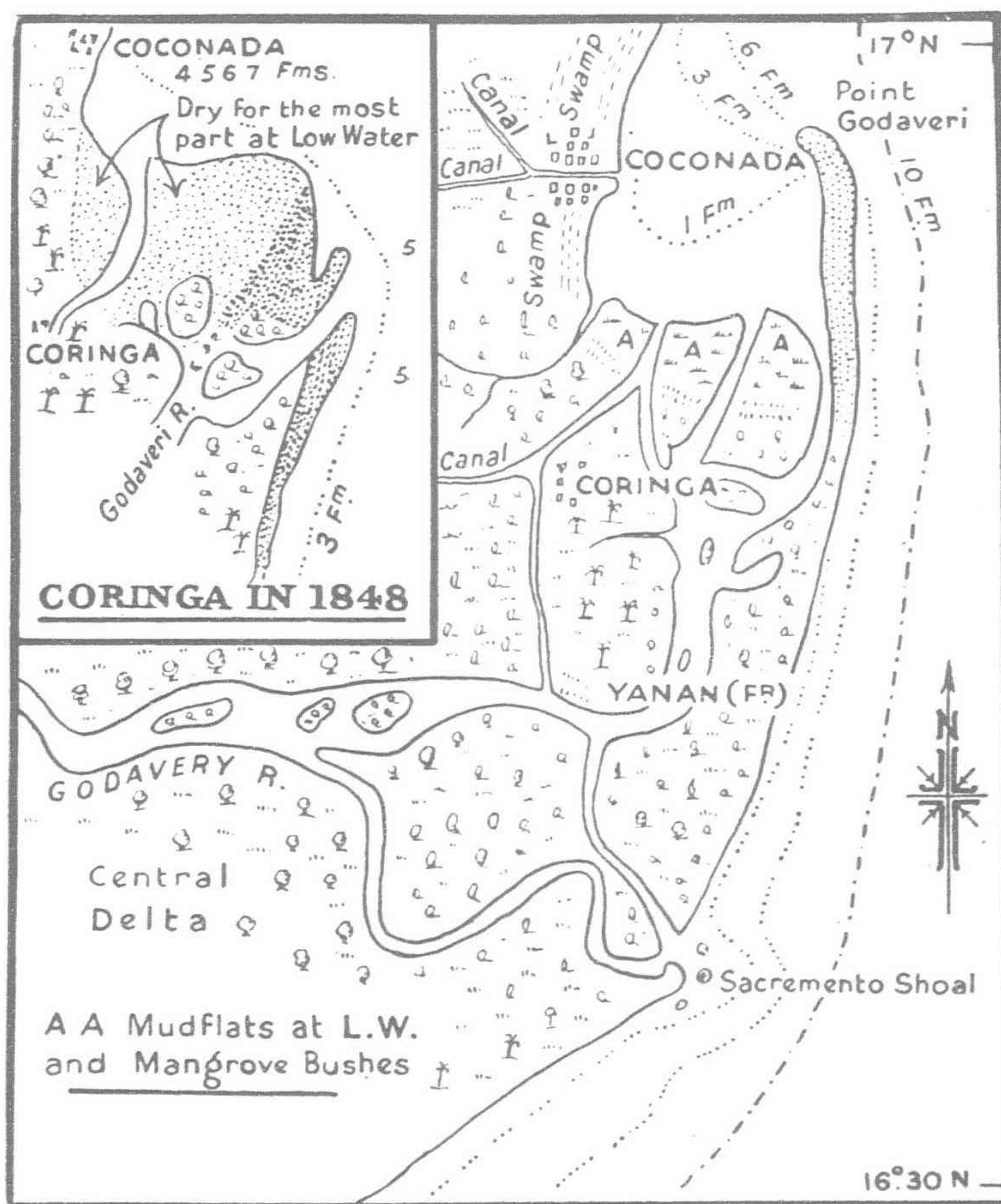


Fig. 4.—Coconada bay—surveyed 1891, revised 1914—soundings in fathoms reduced to I.S.L.W.

(Chart Narsapur to Bimlipatam of 1891, corrected 1914 (Fig. 4) (the soundings in fathoms are reduced to Indian spring low water). In 1787 Coringa was an important port in the 800 miles of coast between Madras and the Hoogly River. The East India Company, at that time, owing to the difficulty of navigating the Hoogly River by sailing vessels, were seriously considering Coringa as the principal port on the East Coast, and Mr. Topping, the Government Astronomer, was deputed to report on Coringa as their chief port. The progress of the delta of the Godavari River seawards has hastened the deterioration of the port, which is now far inland; its place being taken by Coconada, for some time the third in importance of all ports on the East Coast, and considered to have the best and safest anchorage in the Bay of Bengal. The completion of the great Godavari Irrigation scheme begun by Sir Arthur Cotton in 1854, and later by the construction of the East Coast Railway in 1894, brought greatly increased trade to the port. Coconada is the safest natural harbor on the East Coast of India, but owing to the extension of the Godavari River, Coconada Bay is silting up. The shore is liable to periodic inundations during severe cyclonic storms (See *Engineering* October 8, 1937). In the Fiscal year 1938-39 ten sailing vessels with a total tonnage of 1,092 tons and 199 steam vessels with a total tonnage of 66,092 entered the port. In the same year the value of goods imported was rupees 24,663,312, and the value of goods exported amounted to rupees 19,685,121.

Vizagapatam

Four hundred and ninety-eight miles from Madras is built along the shore of a wide bay, receded from the general coast line, and five miles across. The bay is bounded on the South by the Dolphin's Nose, a prominent hill 536-ft. high, projecting into the sea; on the North by a small point called "Waltair Point," which separates the bay from the cove called "Lawson's Bay." The East India Company first settled at Vizagapatam in 1682.

Before the construction of the present harbor the Dolphin's Nose protected the roadstead North of it from the South-West Monsoon, and the littoral drift from the South, so that the depth of water at the roadstead had not altered in any way as far as records were available being five fathoms at low water spring tide, and distant three cables from the shore. During the South-West Monsoon, the beach North of the Dolphin's Nose retrogrades to such an extent that the sea waves used to wash up to the coastal road running East of the town. Such sand as was carried past the Dolphin's Nose, in submerged shoals, accumulating at Waltair Point. During the North-East Monsoon some of this sand was carried back, and a strip of beach formed between the coastal road and the sea (Fig. 5).

To the West of the town a large tidal swamp four miles in extent is drained by a river called the Uppertern, or Salt River, which separates the old fort and town of Vizagapatam from the Dolphin's Nose. The tidal swamp is completely sheltered by surrounding hills, borings showed that a deep navigable channel could be cut through the swamp without difficulty, the chief problem being the sand bar at the mouth of the river. In olden days before being interfered by injudicious reclamation the tidal capacity of the swamp was sufficient to maintain deep enough water over the bar for vessels of 300 tons burden to enter the backwater during spring

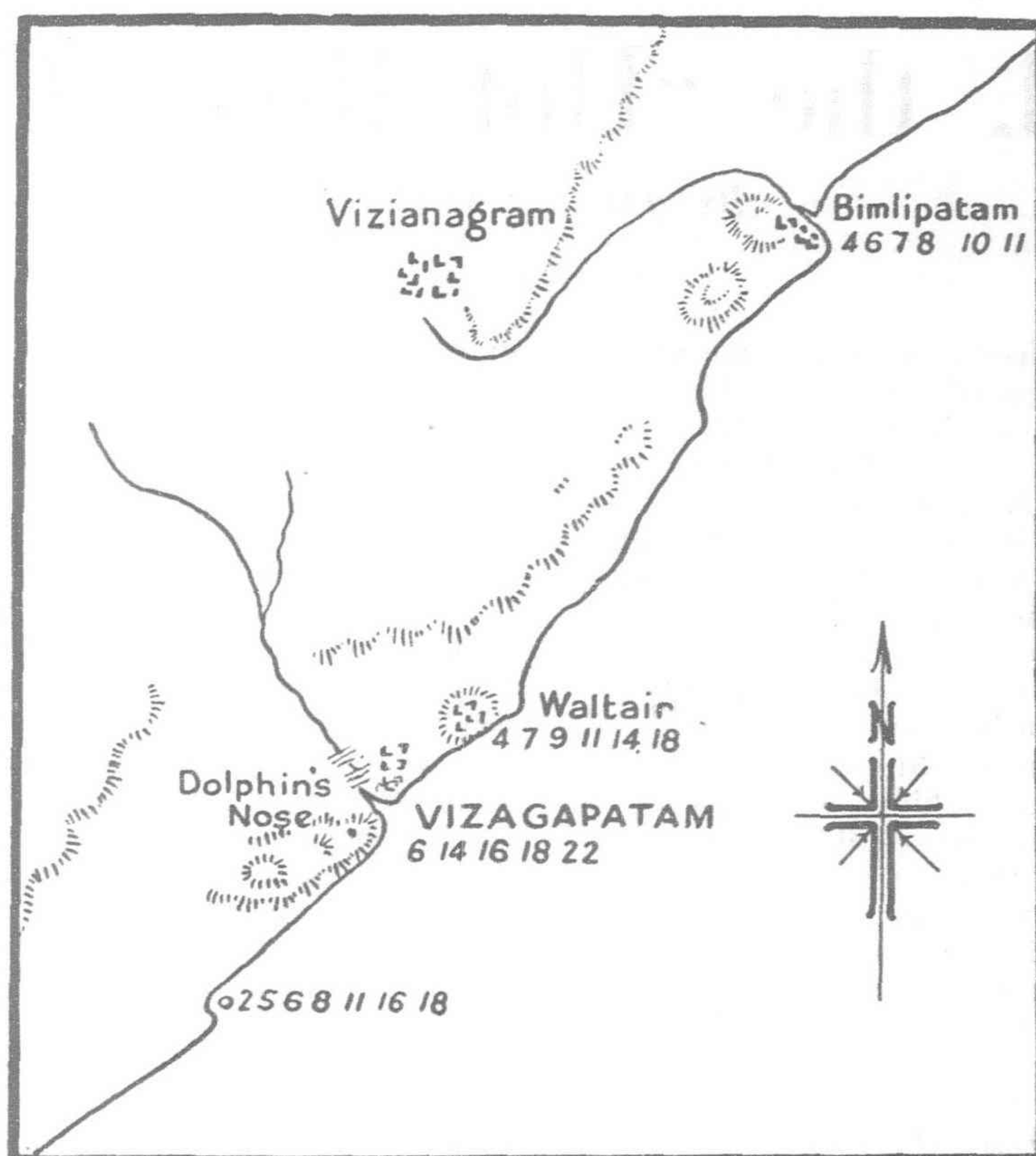


Fig. 5.—Chart of Vizagapatam, 1868

so that before the construction of the present harbor. A 1½-ton Masula boat found it difficult to negotiate the bar at certain seasons of the year.

Various proposals for a harbor at Vizagapatam have been under consideration. To the Bengal Nagpur Railway must be given the credit for faith in the financial justification of the scheme that the present harbor works were put in hand. Details of the construction of the present harbor are given in the *Journal of the Institution of Civil Engineers*, Vol. 1, 1935-36.

Vizagapatam has been considered to be a convenient outlet for trade of certain northern districts of the Madras Presidency, while opening up the rich hinterland of the Central Provinces. The chief exports are manganese, ground nuts, linseed and oil cakes. Manganese exports have so far been the mainstay of the port. Recently, however, the port is gaining in importance as a bunkering port, particularly for vessels leaving Calcutta for Europe. Owing to the restrictions in draft for vessels navigating the Hooghly River, the maximum amount of cargo, and the minimum amount of coal is loaded at Calcutta to enable them to proceed to Vizagapatam where they load sufficient coal to enable them to proceed to their next bunkering port. Arrangements are now being made at Vizagapatam for the establishment of increased storage of bunker coal, and for the construction of a new bunkering jetty.

In the fiscal year 1937-38, the port was open throughout the year for ships of draught up to the equivalent of 28-ft. 6-in. on a tide of +2-ft. The vessel of deepest draft which used the port was the ss. *Ryno Maru*, which left the port drawing 30-ft. 5-in. In the same period 342 vessels entered the port with a tonnage of 1,093,266.

Bimlipatam is the port for the Vizianagram State. The port was formerly of some importance on the Circar Coast. In recent years trade is being directed to the Vizagapatam Harbor.

The port has eight fathoms within a mile of the coast, and ships anchor abreast of the town. The small river Gostanaddi rises in the hills west of Vizagapatam and runs eastwards to Bimlipatam. Cargo is shipped and landed from boats in the estuary of the river. The bar at its mouth sometimes closes in September and has to be artificially opened.

Minor Ports

Excluding the two major ports of Madras and Vizagapatam which are under the control of the Government of India. The

(Continued on page 139)

tides. Mr. D. F. Carmichael, of the Madras Civil Service, in the Vizagapatam District Manual of 1869 states: "Between the Dolphin's Nose and the fort runs the river which is deep enough to admit vessels of 250 to 300 tons during spring tides."

As already stated in former times, cargo used to be carried along the coast in dhoneyes, it was usual for these vessels to avoid the stormy period of the Bay of Bengal by lying up some distance inside the tidal portion of a river, where they were warped into mud docks for their annual repairs. One of the principal ports of call was Vizagapatam, as stated by H.E. the Viceroy of India at the opening ceremony of the Vizagapatam Harbor on December 19, 1933. "Shrines in the vicinity of the spot whose sanctity is connected with seafaring men indicates that for many centuries Vizagapatam has welcomed mariners from overseas, and despatched Argosies to distant countries."

The injudicious reclamation of the swamp has resulted in a reduction of its tidal capacity,

Jehol, the "Hot River City"

By AMAR LAHIRI

(The Tourist)

THE "hot river city" is indeed a magical name and yet it is almost unknown to inquisitive tourists. Those who know something about Chinese history no doubt entertain a tender feeling for Jehol—the cradle of the Ching dynasty. Long before Kang Hsi, the second Ching Emperor, cast a wistful look on this neglected wonderland, it was the home of Mongols who, although preferring their nomadic life, evinced a great regard for this charming spot. So they named it Jehol—the "hot river city." And that name still stands to-day, though it is called Chengte by the Chinese and Syotoku by the Japanese.

Kang Hsi during one of his hunting expeditions realized the importance of Jehol as a strategic stronghold and as a safe retreat from the toils of Imperial duties at Peking. Consequently he built a Summer Palace to initiate the growth of Manchu civilization outside the Great Wall in parallel with the Dragon civilization of China. As a result Manchus began to emigrate and within a few scores of years a Manchu town arose in the city to heighten the gay atmosphere of the Detached Summer Palace. But along with the Manchus came the Hans, despite restrictions, followed by the Mongols, thereby assisting in the speedy transformation of Jehol from a summer resort to a worthy seat of Ching culture.

All that Chengte has accomplished culturally, politically and industrially is due to the noble and magnanimous influence of Chien Lung, undoubtedly the greatest Ching Emperor and perhaps the most democratic monarch who ever sat on the Dragon Throne of China. Chien Lung had a great affection for this mountain-covered place, because he was born here and had spent his dreamy childhood days in the nature-fed surroundings of the Chi En Tien (the Hall of Gratitude). Almost all the Lama temples and the tall buff-colored pagoda that bring mental and visual satisfaction to the observer are his creations. The very soul of Chien Lung, his idea of beauty in simplicity and his great respect for religious tolerance, are ingrained in this city, although time has wrought havoc with it, destroying a great number of cultural and artistic masterpieces. As Jehol has witnessed the growth of a new culture, it has also seen the rise of political intrigues blazing the trail of blood and fire. It is, therefore, a historic city and is the melting pot of Far Eastern civilizations.

To-day, the historic birthplace of Chien Lung looks tragic owing to its sad state of disrepair and delapidation. It appears to be a butchered forlorn relic of the ancient Ching glory, because it has suffered many ravages and been neglected by the successive Chinese Emperors and the Republican regime that exhibited a special bitterness toward Manchu culture. The present Hsinking Government is paying particular attention to preserving it as a living reminder of the Hellenic days of the Manchus. Consequently it is of great tourist interest, apart from its academic importance.

Just over three years ago Jehol was

opened to railway traffic by the South Manchuria Railway and since then tourists from various parts of the world have visited it and have returned to their homes carrying fresh memories of Imperialism and Lamaism blended into one. The Jehol Palace, though it appears to be needing extensive repairs, is still worth seeing. Here one can obtain a perfect glimpse of gossamer harmony between the beauty of Nature and of human art. Here, amidst tumble-down plaster works, pavilions, arbours and a vast rolling wilderness dotted with tall pine trees encased in a rugged stone walling, one can surely imagine how far the Chings worshipped simplicity and religious animism. The Imperial hunting park interspersed with a number of islets and a big pool is still refreshing and invigorating. And when one turns toward the "Slope of the Deer" a cheerful smile will certainly play on his face as he looks at the herd of wandering deer—the last surviving legacy of the Imperial pomp. Not very far from the slope facing the Potala Lama temple overlooking the Imperial home is the famous nine-storied Buddhist pagoda, a creation of Chien Lung.

Jehol, among other things, abounds in religious splendor. Besides Buddhist pagodas, a mosque and a Confucian monastery, there are several exquisite Lama temples of excellent beauty and grandeur. Among them the Potala, a replica of the Lhasa Potala, built by Chien Lung to celebrate the attainment of the age of eighty years by his mother, is indeed a feat of high building skill and spiritual aestheticism. In the background of this massive structure situated on a hill top is a huge castle of Roman pattern within which still remains an imposing image of Buddha worshipped by a few Mongol Lamas. To the east of this temple is Hsu Mi Fu Shou Miao which is an exact copy of the Chash Lompu Miao of Lhasa, the abode of happiness and longevity. It is said that when a Tibetan Lama chief came to offer congratulations to Chien Lung for his seventieth birthday, the Emperor being extremely pleased with the felicitations ordered the construction of the temple as a symbol of Hedonism and long life. Another Lama temple which deserves mention is the Great Buddha temple widely known as Pu Ning Ssu situated on the north-east portion of the Palace compound. Inside this Miao reposes one of the greatest wooden images of Buddha, the magnitude of which can be realized from

the fact that its thumb measures well over a foot. And here was the famous Buddha gallery—known to all Lama enthusiasts—where used to shine no less than ten thousand small Buddha busts made of clay and painted gold. But alas! to-day only one bust remains, the others having fallen victims to impious visitors.

Jehol is now easily accessible by railway both from Peking and Mukden. Whichever way one may travel, he will surely enjoy the rugged mountain beauty all along the rail-track which winds its way through many a tunnel, deep gorge and hair-pin bend, providing thrills for
(Continued on page 139)



The hot spring Joshuitang situated near the town of Lingyuan on the highway that connects Chaoyang and Chengtu in Jehol Province

Philippines Mining; Forecast for 1941 and Review of 1940

(American Chamber of Commerce Journal,
Manila)

THE year 1940 in the Philippines was, for commerce, a generally drab one. For industry it was much better, and the mining industry was certainly one of its bright spots. The value of the gold production has established a new all-time record, and, based on output as reported for the first eleven months of the year, will exceed P.78,000,000 for 1940. This compares with P.72,174,000 in 1939, and represents an increase of about P.6,000,000 or over 8 per cent.

Gratifying as this increase may be, it is somewhat less, both in value and in percentage, than the increase in 1939 over 1938, when the increase was over P.7,800,000 or over 12 per cent. In 1940, several new mines entered the producing ranks. The most important of these were Batong Buhay far to the north in Mountain Province, and Davao Gold, equally far to the south in Davao. The mills of both these mines started crushing ore too late in the year to make much impression on the total gold production of the Commonwealth for 1940.

The major increases in gold production were made by the older established mines which either increased mill capacity, or milled a better grade of ore. Notable among these were Masbate Consolidated, Itogon, Treasure Island, Paracale Gumaus, Surigao Consolidated, and Mindanao Mother Lode. Lepanto Consolidated, the principal copper mine in the Philippines, and one of the really important copper producers in the Far East, marked up a substantial increase in the value of its by-product gold production, due to the greater gold content of the copper ore.

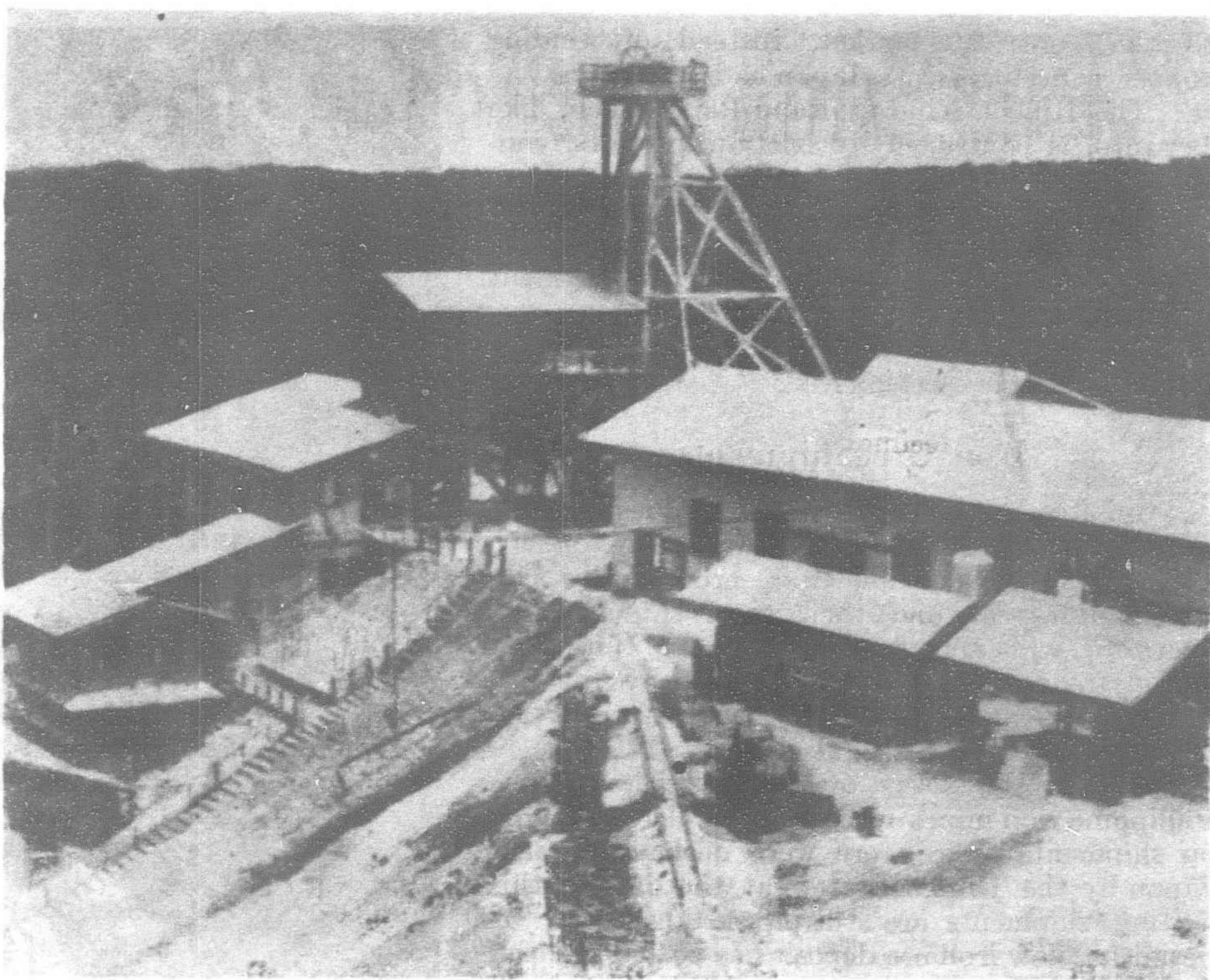
The Surigao gold mines had a good year. Both Mindanao Mother Lode and Surigao Consolidated succeeded in milling more ore than in 1939, and maintaining at the same time better mill heads. Considerable construction and development work went on at East Mindanao, and it is expected that production will be larger in 1941. On the other side of the picture must be recorded the closing down of Kilometer 73 and Tap-i-an due to unfavorable underground development and lack of ore. A new mill of limited capacity is scheduled to be erected on the San Ysidoro property across Lake Mainit.

Outstanding in the Paracale field was the successful record of one of the smaller mines, the Paracale Gumaus, which through virtual doubling of its production has been able to maintain regular dividends. The three Marsman producers, San Mauricio, United Paracale, and Coco Grove, maintained about the same output as in 1939. A severe typhoon that swept through the Paracale-Mambulao area during the middle of December did a great deal of damage around the mines.

Masbate Consolidated, after years of work and preparation, had an excellent year, and reached a new high in tonnage milled and bullion recovered. Dividends were paid for the first time on the stock. The other principal mines in Masbate, IXL and Capsay, maintained regular production.

In the Baguio field, the Itogon mine continued to maintain an improved grade of ore and development underground was encouraging. The Baguio Gold similarly had a good year, and the Big Wedge mine through persistent, courageous development work on the Keystone vein, has been successful in blocking out a new supply of good grade ore that has warranted plans for immediate doubling of the mill capacity. If delivery of equipment can be obtained, a considerable increase in production can be anticipated in 1941 for this property.

Among the smaller producers, Treasure Island, located on Lahuy Island, has made consistent gains in production during the



Paracale Gumaus Consolidated Mining Company Mill; Millsite at left, head-frame, top center, power plant at right

year, and now ranks among the outstanding smaller mines of the Philippines.

Manganese Ore in Demand

1940 has been a good year for Philippine miners of chromite and manganese. Stimulated by the determined efforts of the American government to build up adequate supplies of strategic minerals for insurance against shortage in case of war, the price of manganese ore advanced during the year to about P.33 per ton f.o.b. Cebu ports as compared to an average price of P.20 per ton in 1939, for ores containing 48 per cent manganese. There was much activity in Siquijor and in Busuanga where notable manganese deposits have been developed, and considerable prospecting has been going on in Panay, Camarines Sur and Ilocos Norte. Final figures for manganese production are not available at this writing, but it is known that for the first ten months of the year, the value of manganese productions approximates P.900,000 as compared with P.766,000 for the whole year of 1939. Shipments for the year will doubtless exceed 50,000 tons. Most of this ore is shipped on contract to the United States, a striking reversal of trade trend over 1938-39 when Japan was the principal buyer.

The chromite producers likewise increased production, but although they enjoyed a somewhat higher price for their product, their margin of profit was cut down by increased freight rates and insurance charges. A good demand persisted for high grade ores, but ores containing less than 48 per cent chromite, particularly if the ore were not of the lump variety, had to take a lower price, and much of the latter went to Japan, as it was unable to come up to specifications for American buyers. Developments in the Zambales field, the principal chromite producing area, were encouraging during the year, and the potentialities of the field appear to be larger than ever.

Lepanto Makes a Good Record

The Lepanto copper mine at Mancayan in Northern Mountain Province continued to make substantial gains in production, and the larger profits have been promptly reflected in increased dividend payments. Not only has the grade of the ore improved materially in copper content, now averaging over 4 per cent copper, but the precious metal content also increased, and permits Lepanto to be included along with the other gold producers in the Philippines, in addition to ranking first among the copper mines. During the year a smelter was erected in the property, and it is now possible, if the management sees fit, to produce pig copper for direct shipment

to the American market, instead of sending copper concentrates to Japan as is now done.

The Hixbar mine at Rapu-Rapu which, like Lepanto, is controlled by Nielson interests, continued to produce regularly and a small production was reported from other mines in Cebu. Undoubtedly, the unsettled conditions arising from the war have acted as a brake on new investment in copper mining, but several interesting new deposits have been located that may be developed in a more propitious time.

Iron Ore Shipments

All four of the major iron mines of the Philippines, the Philippine Iron Company, Samar, Paracale Iron, and Gold Star, produced heavily during the year and their total shipments of iron ore will approximate 1,500,000 tons. Although frequently badly handicapped by inability to obtain ocean carriers for their ore, the situation was rapidly improving in December. While there was considerable worry over the position of the Philippine iron mines in case a complete embargo on shipments of iron ore were declared against Japan by the United States, at the date of this writing, shipments are still proceeding freely. A promising new iron ore deposit has been developed during the year near Davao, and this should add materially to the total in 1941.

1941 Gold Output

What of 1941? It appears to be reasonably certain that the gold mines will continue to prosper, and that 1941 will witness another increase in bullion output over the year just closed. The increase, however, will probably not be of large proportions. At the present time, most of the gold mills have been expanded to maximum economic capacity, and further large increases in milling rate, aside from Big Wedge, are not contemplated. It is of course hazardous to prophesy, and doubly hazardous to do so in the mining industry where a single round of holes may conceivably alter the entire picture, but it can be asserted that in the absence of any startling new developments, bullion production should not vary greatly from 1940. There was little prospecting going on in 1940, and while several promising new discoveries were made, these prospects are still far removed from the production stage.

The foregoing is not said in any sense of discouragement. World conditions have been such as to discourage capital investment, particularly of the long term type, and successful gold mines require a lengthy period before they surmount the hard road of development and start to produce. There are vast areas of promising ground to be prospected in the Philippines, and he would be a pessimistic and ill-informed prophet who would assert that the ultimate peak of gold production had been reached.

Granted that there will be no interruption in ocean traffic with the United States, so that essential mining and metallurgical supplies may continue to be freely imported, and that fuel oil for the power plants will still be available at a fair price, then overall mining costs should show a declining tendency as labor becomes more efficient and output per manshift increases. It is a mining truism that as a mine gets better organized, and the men learn to fit into their jobs to better advantage, costs go down. It can be definitely shown in dozens of instances that this is taking place in the Philippines, and the trend is likely to continue for some time ahead.

Profitable Year Foreseen

The Philippine gold mining industry is still young in a comparative sense. It has made marvelous strides during the last eight years, and the Commonwealth now ranks sixth among countries of the world in production of gold. Indicative of the



Aerial view of Suyoc Consolidated Plant

excellence of the mining and metallurgical practice at the mines is the fact that scarcely an issue of the leading trade paper in the United States devoted to the mining industry, fails to have an important article on some technical development in a Philippine gold mine that is considered to be of major professional interest. The prosperity of our gold mining industry rests not alone on rich ore, that can be mined recklessly and carelessly, but on competent and careful work and planning—plus much sweat. The basis is solid. The industry, given fair breaks, can look forward with confidence to a profitable 1941.

Possibilities of Molybdenum

Molybdenite, the most important ore of the metal molybdenum, has been found in small amounts in various localities in the Philippine Islands. It would be remarkable if it had not been encountered somewhere in the mineralized area, for contrary to popular belief that it is a rare mineral, molybdenite occurs in nearly every country in the world. Unfortunately only in rare instances is it found in commercial quantities, and to date there is no knowledge of any deposit in the Philippines that would warrant calling the same a mine, or even a good prospect. Yet with more or less interesting occurrence of the mineral in Camarines Sur, in Marinduque, and in Davao, there appears to be some hope that a worthwhile prospect may yet be found. Molybdenite is frequently found at or near granite rocks or pegmatites, and is frequently associated with other sulphide ores. Geologically the Philippines do not appear to be unfavorable for a deposit of molybdenite.

Certainly the lucky discoverer of a substantial deposit of the ore of reasonably good grade would have small reason to swap it for the ordinary gold mine. Molybdenum ore containing 90 per

cent of the sulphide sells to-day in the United States for 45 cents per pound, or \$900 per ton, f.o.b. mines. This price is for the concentrated ore, and let it be said at once there is no chance of finding any deposit that would even approximate this grade. An ore that contained three per cent molybdenum sulphide would have 60 pounds per ton; if this would be concentrated with a 70 per cent recovery the crude ore would still be worth P.37 per ton, and this would probably be profitable to mine in the Philippines even on a small scale. Such a deposit, containing three per cent of the ore, would be very much above the average. About 66 per cent of the world's output of molybdenum is supplied by a single mine, the Climax Molybdenum Company of Colorado. This remarkable producer has a milling capacity of 12,000 tons per day, about five times as large as the biggest gold mine in the Philippines, and mines molybdenum ore with a content of about 11 pounds per ton, or 0.576 MoSz. It rates as one of the great mines in the world.

The word molybdenum comes from the Greek, meaning lead, and was no doubt suggested to the ancients by the appearance of the ore, which looks and feels a good deal like a piece of fresh cut lead. It is very similar in appearance to graphite with which it is easily confused even by experts. Like graphite, it is soft, shiny, gray or black in color, with a greasy feel, and makes the characteristic pencil mark on paper. However, it can be distinguished from the other by certain chemical tests that are not too difficult to make, and this should always be done before getting too enthusiastic. Molybdenite generally occurs in small ore shoots that are erratically distributed in granite. Locally, these ore shoots may be rich, but they are seldom of any extent. The ore must always be concentrated to bring it up to commercial grade, and this may be done by sorting or milling, using the flotation progress for which the ore is well adapted. While a grade of 85 per cent is usually required, it is possible to sell 65 per cent concentrates on an active market.

Molybdenum is used principally in the iron and steel industry for making special alloy steels, and the field is continually broadening. It may be used alone to impart important properties to iron and steel, but it is generally used in conjunction with them, especially in the manufacture of high speed steel. Molybdenum steel is used extensively in the automobile industry where it is employed in axles, drive shafts, gears, steering knuckles, and similar members.



100-ton mill at Mapaso, Surigao

During the first world war molybdenum went into various types of armament, such as light bullet proof plate for tanks, gun shields, etc., and this war demand sent the price of ore skyrocketing to \$2 per pound. For special stainless steels of the acid, heat, and corrosion-resisting type, molybdenum has proven definitely of value. During the last decade molybdenum steels have been widely used in aircraft construction, and it was this use no doubt that inspired Mr. Roosevelt to address his "moral embargo" to all molybdenum producers against exporting the metal to nations guilty of unprovoked bombing of civilian populations from the air.

Exports of molybdenum are usually in the form of concentrates. The United States supplies practically the rest of the world, although there is a small production from Peru, Mexico, and Norway. It is interesting to note that in 1939, out of a total of \$14,066,000 of molybdenum exported from the United States, the two largest buyers were Russia which took ore valued at \$6,832,000, and Japan, taking \$3,742,000 worth. These two countries accounted for about 75 per cent of the total amount of ore exported abroad. The conclusion is inevitable that if a commercial supply of molybdenite were found in the Philippines, there should be an immediate and satisfactory market for it in Japan, which would save domestic producers the expense of the long ocean haul to more distant points.

Harbors and Ports of the Circar and Coromandel Coasts of South India

(Continued from page 135)

Administration Report of the Minor Ports under the control of the Port Department of the Provincial Government of Madras shows a marked growth of seaborne trade, and a tendency to increase, the statement below shows the value of trade of the chief minor ports on the Circar and the Coromandel Coast for the fiscal year 1937-38 (See Fig. 1).

A large number of laborers proceed from Calingapatam and northern ports to and from Burmah, and from Porto Novo and Negapatam to the Straits Settlement.

Value of Trade in Rupees, 1937-38

Ports	Imports	Exports
Calingapatam	92,690	2,971,256
Bimlipatam	891,652	3,710,000
Coconada	24,663,312	19,685,121
Masulipatam	642,669	17,844,434
Cuddalore	4,375,176	15,406,880
Porto Novo	340,866	241,137
Negapatam	6,001,994	12,391,071

Jehol, the "Hot River City"

(Continued from page 136)

even the strongest-nerved. It is here that a new paradise for the tourist is being gradually opened. In this Land of Lama Miaos one can see at one glance the cultures of Hans, Mongols, Chings, Tatars and Tibetans. It was on this spot that the British Ambassador, Lord MacCartney, came to seek an audience with Chien Lung in 1793 to adjust Anglo-Chinese commercial relations. And here a famous drama about diplomatic etiquette was enacted when the British envoy refused to perform "kow-tow" which ceremony, however, was dispensed with. The Plenipotentiary of King George after fulfilling his mission remained to witness the parade of 100,000 troops commemorating the ninety-third birthday of the Emperor. Therefore, Jehol indeed is a glorious land. Though its glories are gone, the settings remain and are well worth seeing.

New Tokyo Airport

Covering an area of 2,000,000 square yards, the Chofu airport of Tokyo, stated to be the largest and most up-to-date in the Far East, has been completed after months of toil by over 250,000 people, including many volunteers.

This great undertaking cost the Tokyo Prefectural authorities 46 million yen and will replace the Haneda airport, which is now too small and unsuitable in other respects.

The Facts About Chromite

(American Chamber of Commerce Journal, Manila)

CHROMITE and manganese are the two minerals on the list of strategic materials required by the United States in which the Philippines have especial interest, as both occur in commercial quantities within the Islands. Insignificant as the production of manganese has been within the United States, the output of chromite there has been even smaller, and with the expansion of the funds available for purchase of strategic materials to unthought of limits, every attention is being given to possible sources of supply of these two essential minerals for American stockpiles. The importance of chromite is readily appreciated when it is realized that the steel industry, the hand-aid of war, takes three quarters of the domestic consumption.

There are many chromite-bearing minerals, but only one has any commercial importance as an ore of chromium. This is chromite, a chrome-iron oxide, that when pure, contains 68 per cent Cr_2O_3 . Chromite is black to brownish in color, with a brown streak; it is relatively hard, with a specific gravity of 4.3 to 4.5. It is infusible and insoluble in acids. The ore is usually found in ultrabasic igneous rocks, and most commonly in serpentine. It occurs disseminated or in compact masses, lenses, or stringers. In the Philippines large areas of so-called "float" chromite have been noted, which have been formed from the weathering of the lens type of deposit.

The properties of chromite make it very valuable for many purposes, the metal and its alloys being tough and corrosion-resistant. The oxide itself is extensively used as a refractory. According to a compilation made by the U.S. Bureau of Mines, about 50 per cent of the chromite used in the United States is taken for metallurgical purposes, 40 per cent for refractories, and ten per cent for chemical use. Considered from a standpoint of world consumption, 35 per cent is for metallurgy, 40 per cent for refractories, and 25 per cent for chemical purposes.

For these varying uses chromite ores with quite different physical and chemical characteristics are required. In a general way, the usability of chromite is determined by the ratio between iron and chrome in the ore. A high iron content makes chromite less suitable for making ferro-chromium. When the chrome-iron ratio is less than 3:1 the ore may have use as a refractory material or in the chemical field but so long as purer ores are available, it will find small demand from the metallurgical trade.

Thus the Treasury Department Procurement Division specifies for chromite ore that the ore shall contain a minimum of 48 per cent chrome oxide, and that the maximum metallic iron shall be $\frac{1}{3}$ of the actual percentage of metallic chromium.

A great deal of confusion has arisen among chromite miners as to what is actually

meant by the chrome-iron ratio. It does not mean the ratio between chrome oxide and iron oxide, as is usually reported. For instance, a certain ore might be reported as containing 48.0 per cent Cr_2O_3 and 15.7 per cent FeO . It has been carelessly assumed that this represented about a 3:1 ratio, and the ore would be metallurgically suitable. Actually the case is different. The percentage of chromium in the ore is 32.8 per cent (multiplying by the constant 0.684), while the percentage of iron is 12.2 per cent (constant 0.777). This indicates a chrome-iron ratio of only 2.7:1 and the ore would not pass the U.S. government specifications.

According to the Philippine Bureau of Customs, shipments of chromite have been as follows during the five year period 1935-1939:

Year	Metric Tons	Value
1935	1,292.0	P. 27,558
1936	11,890.6	307,518
1937	69,855.6	1,542,100
1938	66,910.8	1,576,845
1939	126,748.6	2,153,640

Most of this ore went to the United States. According to a tabulation of the U.S. Bureau of Mines, the United States in the last two years imported from the Philippines 150,147 long tons of chromite. This represented 78 per cent of the total production in 1938-9.

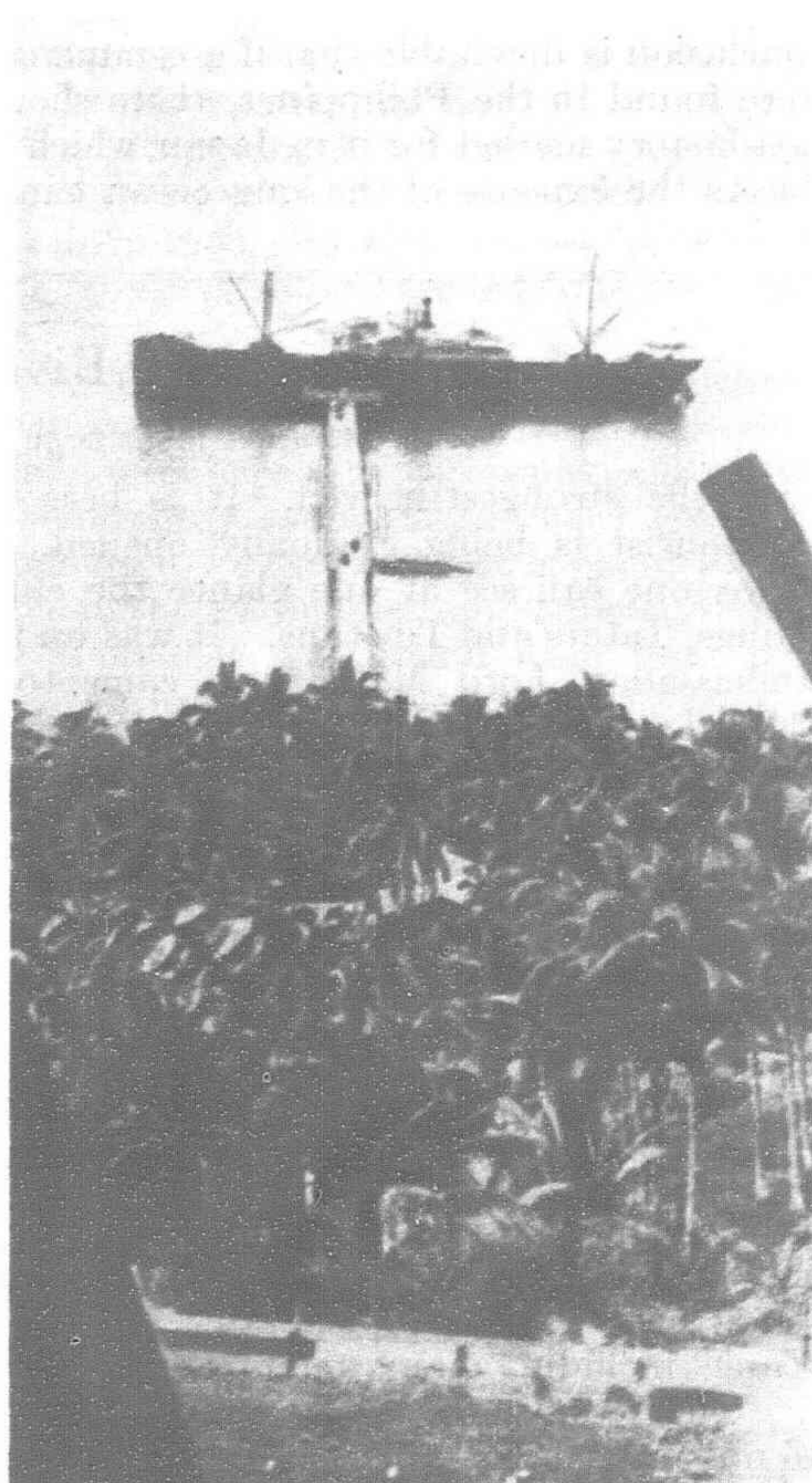
According to a statement by an executive of the Benguet Consolidated Company which operates the huge chrome ore deposits at Masinloc, Zambales, in 1939 this mine shipped 73,363 tons with a value of P.876,650 net returns. This ore, which is believed to average about 34 per cent Cr_2O_3 , was all sold for refractories manufacture, being too low-grade for metallurgical use, and was worth P.12 per ton.

It appears from the table cited above that 126,748 tons of chromite were shipped from all Philippine mines in 1939. If

the Masinloc shipments are deducted, there remains 52,798 tons that presumably went to manufacturers of ferro-chrome. This latter was high-grade ore, 48 per cent Cr_2O_3 or more, and was worth approximately double the value of the refractories ore, or P.24 per ton. It is this type of ore that is so urgently in demand in the United States to-day for the stockpiles.

The statement has sometimes appeared in print that the Philippine chromite deposits are the largest in the world. This is a half-truth and without further explanation may be misleading. It is true that the Masinloc deposit, which is estimated to contain about 10,000,000 tons of ore, is no doubt the largest individual deposit of

(Continued on page 143)



Loading chrome ore for export



An open cut at a chrome mine

Rubber Production in the Philippines

THE Commonwealth of the Philippines, realizing the bright possibilities of the rubber industry, has formulated plans for the commercial cultivation of rubber trees. Prominent Filipino financiers, including the sugar barons of Negros, have banded themselves and have started the exploitation of the rubber trade.

President Manuel L. Quezon while on an inspection trip in Iloilo City on June 30, last, announced that the government will help any corporation or individual desiring to engage in the cultivation of rubber. Financial as well as technical aid will be given to those interested in the enterprise to facilitate the development of the rubber industry and make the Philippines one of the principal sources of world rubber.

In accordance with the recommendations of Manuel Roxas, Secretary of Finance of the Commonwealth and Chairman of the National Economic Council, President Quezon announced the following points in the development of the Philippine rubber industry:

First.—Corporations having capital of not less than P.200,000 will be allowed to acquire 1,024 hectares in areas suitable to the cultivation of rubber. The lands will be given to them under a long term lease at minimum rental. The Agricultural and Industrial Bank of the Philippines will extend such credit as may be required after the exhaustion of their capital to be disbursed gradually as it may be needed not exceeding the total amount of the capital actually invested. The credit is payable in 10 equal yearly instalments from the date when the majority of the rubber trees have reached the production stage with interest of four per cent.

Second.—A total of 200 hectares in properly selected localities will be leased to private individuals who will be required to raise at least P.30,000 capital in cash. The Agricultural and Industrial Bank of the Philippines will extend credit to such individuals after they had spent their P.30,000 capital an amount not exceeding P.50,000. This credit shall be extended and paid in the same manner as the loan given to the corporations.

Third.—Settlers of the government sponsored National Land Settlement Administration will be given 12-hectare lots each if they want to engage in rubber planting. The settlement administration will have a central processing mill where settlers will be required to bring their latex, seed farm and an experimental station. Settlers engaged in rubber cultivation will be given financial help as may be needed by them.

The Story of Rubber

The world supply of rubber originally came from the wilds of Brazil, Bolivia, Mexico and Africa. In the 19th century, the Amazon valley supplied most of the commercial rubber needed by the world. South American rubber production in recent years has greatly receded as the center of the rubber industry has been gradually shifted to the countries and islands in Southwestern Asia.

The big scale transplanting of the Brazilian rubber trees to the Middle East was attributed to Sir Henry A. Wickham, an Englishman. In 1876, Sir Henry obtained about 70,000 seedlings of the *hevea brasiliensis* from Brazil. These were brought to England and with the help of the Royal Botanical Garden, some 2,700 seeds were successfully germinated at Kew Gardens, near London. These seedlings were subsequently transplanted to the botanical gardens in Ceylon near Colombo. A few young trees were later sent from Colombo to Singapore and from there at other points of the British Federated Malay state.

From such a humble beginning, the planting and tapping of rubber trees have become one of the biggest business enterprises in southwestern Asia. Wickham was knighted for this notable accomplishment and became known in history as the Father of the Plantation Rubber Industry. In 1905, the rubber plantations in British Malaya produced less than 200 tons. In 1934, when world production of rubber hit its highest level amounting to 1,019,000 tons, British Malaya furnished nearly one half or 467,000 tons. Brazil, Africa and all other wild rubber regions contributed only 1.4 per cent.

In the same year, the Dutch East Indies comprising Sumatra, Java and Netherlands Borneo yielded 380,000 tons; British North Borneo, 29,000 tons; Siam, 18,000 tons; French Indo-China, 20,000 tons; Burma, 12,000 tons; and Ceylon, 79,000 tons. Brazil, the original home of rubber trees, furnished only 9,000 tons.

In 1935, it was estimated that 3,300,000 acres of British Malaya were planted to rubber trees; Ceylon, 606,000 acres; Sarawak, 265,000 acres; British North Borneo, 114,000 acres; British India and Burma, 250,000 acres; Netherlands East Indies, 3,500,000 acres; French Indo-China, 311,000 acres.

In 1905, the same year that British Malaya first produced rubber on a big scale, the Philippines started on its rubber venture. Around 20,000 seedlings were distributed by the bureau of forestry to Filipino and American landowners in Mindanao and Basilan. Owing to the lack of positive encouragement, especially from the government, the industry progressed slowly.

Firestone's Great Project

Harvey Firestone, Jr., American rubber magnate, came to the Philippines in 1923 to propose the establishment of a big rubber plantation in Mindanao. Failing in his mission, he returned to the United States. Again, 1926, he returned more determined than ever to start a rubber plantation. He succeeded in persuading some legislators to introduce in the Philippine Legislature (now the National Assembly) a bill increasing the holding limit of public land from 2,500 to 500,000 acres under a 75-year lease contract. The bill despite promise of big rewards from the rubber industry met stiff opposition and failed to get legislative approval.

Two years after Firestone failed in his effort to establish a big rubber plantation in the Islands, the Goodyear Tire and Rubber Company started a plantation in Mindanao on the area of land allowed by the law. The company capitalized at P13,230,000 has helped in giving impetus to the development of the rubber industry in the country. It is conducting experiments and adopting modern agricultural practices. Aside from the Goodyear Tire and Rubber Company, there are three other American-owned rubber plantation firms in Mindanao—the Basilan Rubber Plantation Company capitalized at P.600,000; Rio Grande Rubber Estate, Inc., capitalized at P.1,000,000; and the American Rubber Company capitalized at P.600,000. The Basilan Rubber Plantation Company made the first commercial tapping of 15,000 trees in the Islands in 1915.

World consumption of rubber in recent months has increased substantially owing to the accelerated buying by America and the British Empire. Rubber is considered one of the strategic raw materials in pursuing the war preparedness program of the United States. As a result of this spurt in the world demand for rubber, ready stocks in British Malaya and Netherlands East Indies have been reduced considerably. British Malaya in May, 1940, shipped 74,682 long tons of raw rubber abroad.

Rubber imports of the United States, one of the largest consumers of this commodity, soared to 70,699 tons in April, 1940, which entered at 17.6 a pound. In May, the imports totalled 51,431 long tons. The closing of the markets in France, Germany and Italy as a consequence of the war has not so far affected very much the normal world demand for rubber. Realizing the importance of rubber, the Rubber Reserve Corporation capitalized at \$5,000,000 was organized by the federal government of the United States.

The Commonwealth of the Philippines is certainly launching its big scale rubber development program just at the time when rubber is in big demand in the world market. Aside from the heavy overseas demand, rubber shoe factories in Manila itself need plenty of raw rubber. These companies are the Mabuhay Rubber Shoe Corporation and the El Porvenir Rubber Shoe Company.

The Philippine government in launching its rubber development program takes the following matters into consideration:

First.—The average cost of production should equal if not lower the cost of production in the Middle East where the world gets its bulk of crude rubber.

(Continued on page 144)

Collapse of the Tacoma Bridge

An event which has attracted the interest of engineers in every part of the world was the wrecking from wind pressure on November 7 last of the new Tacoma Suspension Bridge across Tacoma Narrows of Puget Sound connecting the city of Tacoma with the Olympic Peninsula. The disaster occurred only four months after the great structure had been opened to the public in July of last year following twenty-one months of construction work. The bridge, representing a type that has been developed particularly by American engineers in recent years, was unique of some respects and it had the third longest center span in the world, 2,800 feet. For those who have awaited a technical account dealing with causes of the failure of the structure the following article is reprinted from the *Engineering News-Record*.

* * *

WIND wrecked the 2,800-ft. main span of the Tacoma Narrows suspension bridge shortly before noon, Thursday, November 7. Almost the entire suspended structure between the towers was ripped away and fell into the waters below, but the 1,100-ft. side spans remained intact. Cables and towers survived and held up the weight of the side spans, though the latter sagged about 30-ft. as the towers, which are fixed at the base by steel anchors deeply embedded in the concrete piers, were bent back sharply by the unbalanced pull of the side span cables.

Fortunately there was no loss of life, as only a few persons were on the bridge. Traffic had been limited or shut off some time before because of the excessive and dangerous motion of the bridge. Among those on the span at the time was Professor F. B. Farquharson, of the University of Washington (Seattle), who had been conducting extended experiments on a model of the bridge with a view to controlling its oscillation. At the time of the collapse he was on the main span taking motion pictures of the abnormal waving and twisting.



Side span after the collapse

Wind Conditions Not Abnormal

A wind reported as 42 m.p.h. was blowing on the morning of the accident. Higher winds had been experienced previously without damage, but this wind caused a vertical wave motion that developed a lag or phase difference between opposite sides of the bridge, giving the deck a cumulative rocking or side-to-side rolling motion.

Failure appeared to begin at mid-span with buckling of the stiffening girders, although lateral bracing may have gone first. Suspenders snapped and their ends jerked high in the air above the main cables, while sections of the floor system several hundred feet in length fell out successively, breaking up the roadway toward the towers until only stubs remained.

Efforts to Check Wave Motion

Tie-down cables that had been put in the side spans to damp out vertical wave motion previously observed on the bridge are credited with having

prevented the violent waves in the main span from being transmitted to the side spans and perhaps doing greater damage to the towers. However, with the load removed from the main spans by the fall of the floor, the side spans sagged 30-ft., making the check reins inoperative and permitting a movement which buckled the stiffening girders and deformed the steel in the floor system.

Under the unbalanced loading the towers were bent back 12-ft. shoreward (about twice the designed maximum) until unloading of the side spans began, when the tower deflection gradually decreased. Outward evidences of tower damage are buckled plates and angles, especially near the piers where plate thicknesses are $\frac{1}{2}$ -in. to $\frac{3}{4}$ -in. An inspector reports that the cables show no evidence of movement in the saddles in the course of the violent bouncing. The piers are believed to be undamaged.

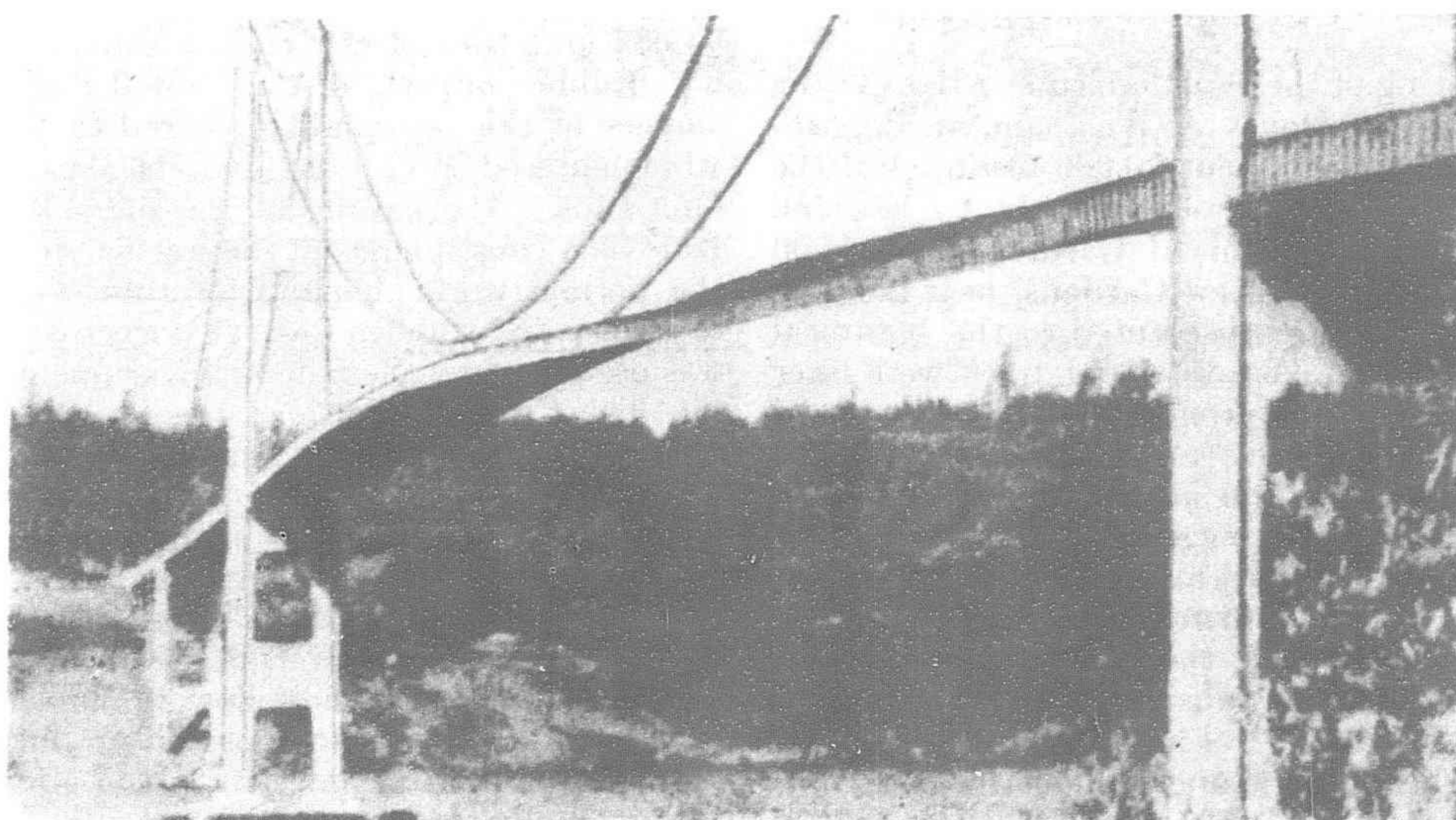
Tacoma Narrows bridge, third longest suspension span in existence (Golden Gate, 4,200-ft.; George Washington, 3,500-ft.; Tacoma Narrows, 2,800-ft.) was built between October, 1938, and July, 1940, and was opened to traffic in July. It was by far the most slender suspension bridge ever built, both laterally and vertically, the width of the roadway and spacing of cables being only 39-ft. (span ratio 1:72), and the depth of the stiffening girders 8-ft. (span ratio 1:350).

In general conception it followed the model set by the Whitestone bridge (span 2,300-ft.), but was longer in span and much narrower. To suit the expected traffic it was built for only two traffic lanes against six on Whitestone and Golden Gate and an ultimate of twelve on the George Washington bridge.

Wave Motion Studied

The destructive wave movements that wrecked the bridge were the sequel to a history of disturbing oscillation that had been under observation and study since the bridge was built. Similar but much smaller oscillation occurs on the Whitestone bridge, but while there it amounts to only a few inches, the vertical waves in the Tacoma bridge were very much greater, having reached as much as 50-in. amplitude.

Various means were tried to check the movement, and elaborate model experiments were conducted, those for Whitestone by Professor E. K. Timby at Princeton University and those for Tacoma Narrows by Professor F. B. Farquharson at the University of Washington. The Tacoma Narrows model, 54-ft. long, is a precise scale representation of the bridge in 1:100 ratio and is fitted with a series of electromagnets to apply horizontal and vertical forces simulating the effect of wind pressures. It was found that the behavior of the



Photograph taken before the disaster occurred showing waving motion of the bridge

actual bridge could be duplicated with great accuracy, and various corrective arrangements and devices were tried out.

Tie Ropes Reduced Movement

In the Whitestone bridge short inclined rope ties were placed between midpoints of the main cables and the top flanges of the stiffening girders to hold the bridge deck from moving longitudinally with respect to the cables, and friction brakes were placed at the connection of bridge deck and towers to damp any longitudinal movement; these provisions reduced the vertical oscillation materially.

At Tacoma Narrows one control method applied, after proving effective on the model, was to tie down a point in each side span to the ground below. Such tie was provided on the bridge in the form of 1½-in. cables extending from the deck of the side spans to 50-yard concrete anchors on the ground below, at points 300-ft. out from the anchorages. These ropes broke three or four weeks ago during a moderate blow. Diagonal ties from the tower tops to the stiffening girders were considered but not tried.

Streamlining Found Effective

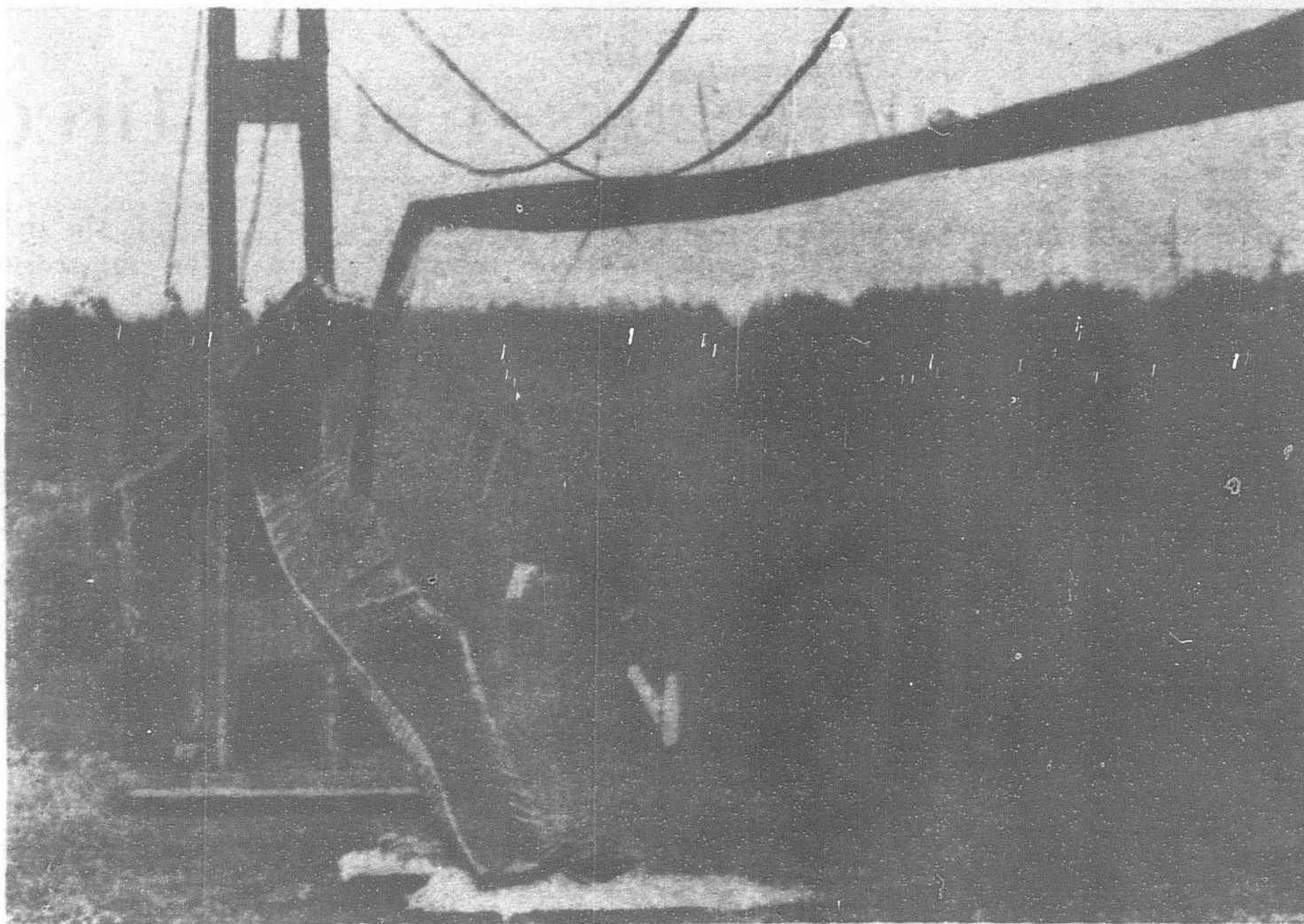
Recent work with the big Tacoma Narrows bridge model and with smaller models exposed in a wind tunnel was directed to determining whether the form of the stiffening member contributed to the oscillation trouble, and to trying out the effect of various shielding or streamlining fascia arrangements along the sides of the girders. Proper streamlining almost completely suppressed the disturbing wind effects, it was found. Application of these experimental findings to the bridge had not been possible at the time of the accident.

Prior to November 7 such vertical waves as had occurred never got out of step on opposite sides and no damage was done, although at times smooth uniform waves with as much as 50-in. amplitude were observed.

Ten different wave periods had been observed on a 1:100 model in the University of Washington laboratory, and on the bridge itself, observed perhaps more frequently than others, was the twelve-second period, the same as the period of the towers.

In the various waves it had been noted that the mid-span was subjected to the least vertical movement and, presumably, to the maximum of flexure. It was here, most witnesses say, that the first structural failure occurred.

Supporting the theory that the stiffening girders were the first to fail is a picture that shows a decided disalignment of these girders at mid-span (possibly a kink or a shear rupture) at a time when the concrete roadway can be seen to be still intact. Another picture, taken soon after the first concrete fell out, shows a pair of diagonals of the lateral system broken loose and hanging below the floor system.



Picture of the bridge after the collapse

Eyewitness Account

F. B. Farquharson, Associate Professor of Civil Engineering, University of Washington, who directed the model studies and is familiar with the traits of the bridge, was on it as the destructive wave motion built up. He reports that the deck tilted from side to side more than 45 deg., that the edges of the deck had an up-and-down movement of 28-ft. and that the acceleration in the movement of the deck at times exceeded that of gravity.

Conditions observed in the collapse support the theory, reached about a month ago, that the cause of the vertical waves was aerodynamic instability of the floor system. A 1:20 model of a section of the floor system, tested in the wind tunnel at the University of Washington, was found to have unstable characteristics that fully account for the wave movement. This test was followed by studies looking to remedial measures. These had been developed and a contract for their installation on the bridge was under negotiation when the collapse occurred.

The remedy is extremely simple, consisting of a deflector vane that changes aerodynamic characteristics in such a way as to prevent the continual reversal of vertical components of wind forces. Unchecked, these forces build up cumulative wave motion, which, after a considerable weight of bridge deck is involved, accumulate destructive energy.

Prospects are for immediate reconstruction of the bridge if the condition of towers and cables justifies. Removal of the floor of the side spans is now in progress, and final decision on whether the cables and towers will have to be dismantled must await completion of this work and inspection after the unloading. The bridge was insured, so that there will be small, if any, loss to the State and the Federal financing authorities.

The Facts About Chromite

(Continued from page 140)

chromite known to-day. Unfortunately this ore is below the grade demanded for metallurgical purposes and cannot be used unless some process is found for beneficiating it so as to bring up the grade, for which there is some possibility. If the Masinloc deposit is omitted, the reserves of high-grade chromite ore, while of decided potential importance, are yet to be developed to a point that allows quantitative estimate.

The United States imported 317,511 tons of chromite in 1939, in the main from South Africa, including Rhodesia, from Cuba, Turkey, and the Philippines. Domestic production was nearly negligible being only 3,614 tons, or hardly more than one per cent of the imports.

The price of chromite ore increased after the outbreak of the European war. During the early part of 1939, 48 per cent chromite sold at \$23-\$24 per ton. In October the quotation rose to \$25-\$26, and in December to \$26-\$28. It has since remained around that figure. Higher ocean freights and increased insurance charges have caused little of the price increase to benefit the producer, however. Actual scarcity of cargo space on ocean freighters has still further hampered shipments. Future prospects, however, are reasonably good, and it is believed that the Philippines may continue to supply a considerable proportion of the United States' requirements.

New "Caterpillar" Rubber-tired Industrial Tractor

A RUBBER-TIRED industrial tractor, powered by a 90 horsepower Diesel engine and capable of hauling more than 13 tons of earth at 18 miles an hour, has been announced by Caterpillar Tractor Co. of Peoria, Illinois. "Caterpillar" has also designed and built an 11 cubic yard heaped measure, bottom dump, pneumatic tired wagon to go with the new tractor. Hydraulic scrapers, especially designed for the machine are manufactured by the LaPlant-Choate Mfg. Co., Inc., of Cedar Rapids, Iowa; and cable controlled scrapers, by R. G. LeTourneau, Inc., of Peoria.

The DW-10 tractor has been introduced after more than three years of intensive development work and field tests. It is built specifically for use on roadbuilding, construction and national defense projects, where speed, long hauls and other physical conditions are favorable to rubber tires.

Powered by the D468 "Caterpillar" Diesel six-cylinder, water cooled automotive engine, the tractor weighs 14,500 pounds, and has a tractive effort of 13,000 pounds in low gear, with a loaded wagon or scraper. A quick acting, vertical type governor gives fast pickup to get the loaded tractor and wagon to full speed almost immediately. The transmission is the constant mesh type, and has five forward speeds, ranging from 2.4 to 18 MPH; and one reverse speed of 3 MPH.

The DW-10 tractor has a "high traction" differential, which gives increased pulling ability under unfavorable ground conditions, plus longer tire and engine life. Engineered for heavy duty hauling service, the differential applies greatly increased torque to either driving wheel, should the opposite wheel start slipping. In addition to increased pulling power, this increase in torque lessens tire slippage, as well as keeping a more even load on the engine. The actual transfer of torque from one wheel to the other reaches a ratio as high as 1.7 to 1 with this differential.

The braking system consists of foot pedal operated, independent, hydraulic brakes for each rear wheel of the tractor, which

permit the operator to turn the unit short on restricted roadways. The non-stop turning radius of the tractor and wagon is only 20 feet. A lever operated vacuum booster acts on both the tractor brakes and the hydraulic brakes on the rear wagon wheels for stopping the unit. A mechanical parking brake is also provided.

The DW-10 tractor is designed to produce a maximum of work with a minimum of discomfort and fatigue to the operator. There is a full floating seat assembly mounted on a spring, which is adjustable to compensate for varying weights of operators. A snubber is also adjustable to a recoil frequency most desirable by the individual operator. The entire seat floats with road irregularities, and eliminates the bouncing of the operator on and off the cushion, as well as the friction between his back and the back and side arms of the seat.

Finger-tip steering through a hydraulic booster arrangement requires steering effort of only one pound at the rim of the 20-in. wheel. All tractor controls are readily accessible to the operator. The dash is provided with a lubricating oil pressure gauge, a temperature gauge, a tachometer, an ammeter, a vacuum gauge for the air brake system, and a fuel oil gauge.

The left hand hood door of the tractor is unperforated to prevent engine heat from blowing into the operator's face. Immediately to the right of the foot brake pedals is a small door which can be removed in winter operation to admit a draft of hot air from the engine directly to the operator's position. Electric starting and sealed beam headlamps are standard equipment.

The "Caterpillar" W-10 wagon has 8½ cubic yards struck measure capacity, and 11 cubic yards heaped measure capacity. The body is of the hopper type to provide a large target, insuring economical loading operations with any type of loading equipment.

It is constructed of pressed shapes formed from plates of special alloy steel, and is of all welded construction to provide maximum strength. The body measures 13-ft. 2½-in. in length by 6-ft. 11-in. in width at the top; and 10-ft. 10-in. by 4-ft. 9-in. at the bottom. It has a depth of 3-ft. 6-in.

A rear bumper is provided on the wagon to facilitate dumping or loading operations where a pushdozer is required. It also acts as protection to the rear wagon tires.

The full length bottom dump doors on the wagon are hydraulically operated from the tractor, and are designed to permit ejection of material at any desired speed, thus reducing the amount of bulldozing necessary on the fill. There are approximately 31-in. of clearance with the doors in hauling position; and 13½-in. clearance with doors open to a maximum.

Rear tires on the DW-10 tractor and the W-10 wagon are the same size—18 by 24 16-ply. The tractor-wagon combination weighs 24,500 pounds and measures 32-ft. 8-in. in length.

SHANGHAI POWER COMPANY

To our Consumers:

In view of the present shortage in the supply of fuel for our Riverside generating station it is urgently requested that you reduce your use of electricity as much as possible.

Every effort is being made to obtain additional fuel and you will be informed the instant that any relief is secured. Until such time it is essential that you conserve the use of electricity.

L. M. Pharis,
Vice-President and General Manager

Rubber Production in the Philippines

(Continued from page 141)

Second.—What laboratory rubbers can do in the future is something that must be reckoned with. At present the cost of producing synthetic rubber is high. The quality and durability of artificial rubber is also doubtful. However, the case of the indigo industry readily comes to mind.

Third.—In order not to affect the balance between supply and demand, the Philippines will pursue its rubber development program on producer-consumer basis. Experts have foreseen that it is not wise to increase rubber production by all the amount of rubber which the Philippines is capable of producing for that might disturb the economy of supply and demand eventually causing a terrific crash in prices.

Surveys and research showed that rubber trees thrive best in the equatorial region. The Philippines is included in this area. The southern tip of the country, particularly Mindanao, Basilan, Jolo and Palawan, is found ideal and suitable to the commercial cultivation of rubber trees.

The Philippine Government is confident that its rubber industry will forge ahead and that eventually the country will become one of the principal sources of raw rubber.